

Sandia Now in Superconductivity Race

"Overnight success" is usually a figurative phrase, but this time it's literally true. On March 2, Sandia was not a contender in the ongoing race for a really practical superconductive material. By the morning of March 3, Sandia was moving up fast.

Superconductivity, the absence of electrical resistivity at very low temperatures, is one of the most discussed, least predictable of the physical phenomena. Simultaneously perplexing and exciting, superconductivity is suddenly hot in terms of research attention around the country. And, as of last week, Sandia's a part of the scramble that was initiated by the Universities of Houston and Alabama.

And the scramble is almost literal — visit the third floor of Bldg. 806, where Jim Schirber (1150), Dave Ginley (1144), Bruno Morosin, Gene Venturini (both 1131), Jim Kwak (1152), and several other researchers continue to perform superconductivity experiments around the clock, keeping each other informed of the latest successes and failures as they scurry between labs and offices, barely taking time for necessities like sleeping or signing time cards.

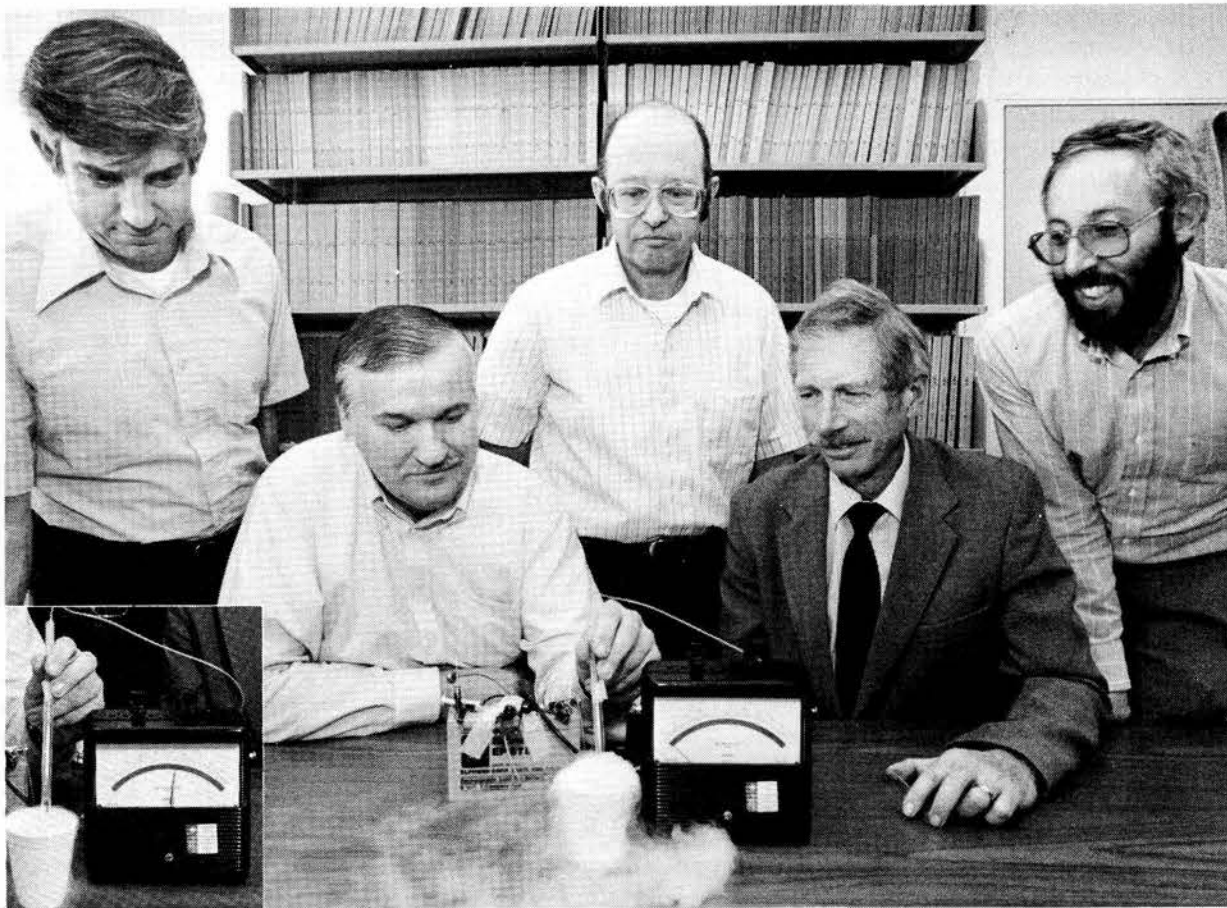
"It's easily the biggest breakthrough in any area of science I've worked on in my 25 years at Sandia," says Jim Schirber.

"And it's definitely the most exciting time of my career," confirms Dave.

Theory of Superconductivity

Superconductivity's existence has been known since 1911 (see "Historical Perspective" story), but the temperatures needed to achieve it have been so low — from just above absolute zero (0 Kelvin or

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IN DESKTOP DEMONSTRATIONS in Jim Schirber's (1150) office last week, a small sample of a revolutionary new superconductor material, connected to a battery and a voltmeter, was dipped into a beaker of liquid nitrogen. The electrical resistance (the ratio between the voltage and the amperage — 50 or so milliamps in this case — supplied by the battery) dropped from about 110 milli-ohms (see inset photo) to zero in seconds. "That is what just boggles everyone's mind," says Jim. The superconductivity team (from left): Gene Venturini (1131), Jim Kwak (1152), Bruno Morosin (1131), Jim Schirber (1150), and Dave Ginley (1144).

Fund for Slain Sandian

A fund has been set up at the Credit Union for those who would like to contribute to Crime Stoppers in the memory of Gloria Padilla, who was killed late last month. Call or stop by the Credit Union to have funds transferred to "The Gloria Padilla Fund" or send the CU a check payable to "Eugene Theriot, Acct. #0002" (write "Gloria Padilla Fund" in the Memo section of the check).



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Some Tech Transfers Are Softer than Others

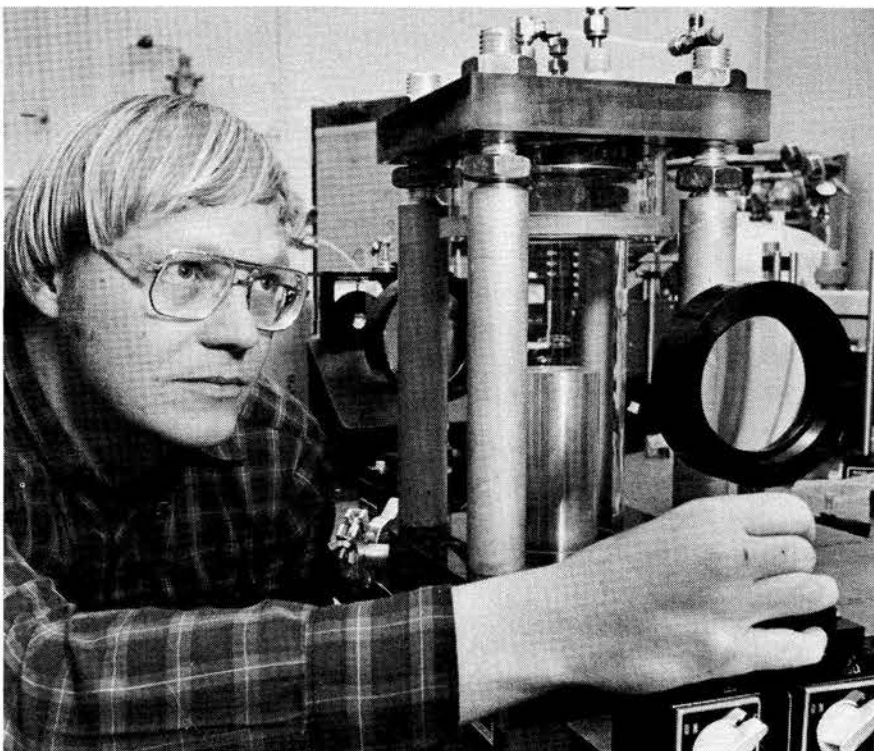
Many ideal marriages between Sandia science and private companies depart from the ideal, the stereotypical definition of tech transfer. That is, no product — or whole recipe for a product or device — is literally handed over: The help given private industry is "soft."

The technology may simply be an improvement or a refinement of an existing process, and the mode of transfer may be a series of phone calls or a technical report.

One case of soft transfer is that from several Sandians in Livermore and Albuquerque to EMCORE, a New Jersey-based original equipment manufacturer in the compound semiconductor industry. For about a year, EMCORE has produced rotating-disk reactors (RDRs) for gallium arsenide and similar compounds used in the process of chemical vapor deposition (see "CVD: The Process" story).

Companies producing commercial RDRs, such as EMCORE, are trying to continue to produce high-quality films — microscopically thin coatings that are rust- and corrosion-proof. The problem is that the wafers on which the films are laid down are getting larger — edging up to eight inches in diameter — and microelectronics features are getting smaller.

What the companies need is greater control over the uniformity of deposition — which can be obtained by a better understanding of the CVD process and by new reactor designs (see "Basics First"). The RDR is one such design, in which gas is jetted onto a wafer that sits on top of a rapidly spinning, heated disk.



BILL BREILAND (1126) adjusts a lens through which laser beams pass into a glass rotating-disk cell for diagnostic purposes. Bill is using interference holography to map out the temperature field above the "disk" (large, metal cylinder), on which a wafer would be placed, to obtain uniform deposition of thin films.

What companies need to know are details such as how the deposition rate, the heat distribution over the heated disk, and the flow pattern depend on variables such as the disk temperature, the spin rate, and the gas composition.

Last year, Greg Evans (8245) and Ralph Greif (U.C. Berkeley) numerically simulated the three-dimensional gas flow and heat transfer in an RDR.

Their work was partly funded with a BES (Basic Energy Sciences) grant held by Wayne Johnson, supervisor of Laser and Atomic Physics Division 1126 — and was carried out in support of an experiment undertaken by Bill Breiland (1126). The results of Greg's simulations were distributed in a SAND

(Continued on Page Three)

Antojitos

Our Lead Story tries to give a flavor of the excitement in Bldg. 806, where a team of Sandia researchers is working frantically -- but, of course, systematically -- toward pushing back the frontiers of superconductivity. The team is cross-disciplinary, cross-organizational, cross-rank (MTS through department manager), and sometimes, when frustration mounts, simply cross. Sandians in the main are stoic folks, even when they've developed something never before developed. So I've seldom, in my 21 or so years at Sandia, heard researchers and their management use words such as "incredible," "exciting," "exhilarating," "patent this now," "publish this tomorrow," "watershed," or "breakthrough."

Incidentally, thanks to Ken Frazier of Public Information Division 3161 for his 24 hours of help in covering the story.

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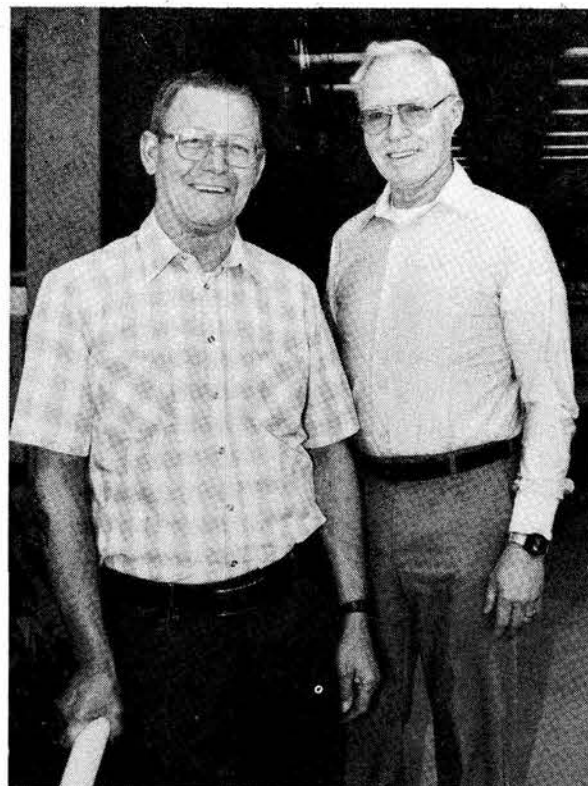
Booklet With a Past Twenty-five years ago, President Kennedy was scheduled to visit Sandia -- as was an overwhelming entourage of reporters, most of whom had never been to or heard of the place. Sandia had no general-purpose information booklet (see Page Six) in those days, only one used for recruiting, and we wanted to enlighten our visitors, not hire them. So Jim Mitchell (then 3161, now 3160) prepared a general fact sheet for use in briefing the reporters. It remained in mimeograph form, updated whenever necessary by Phyllis Wilson (then 3161, now 3162); she put it into booklet form in 1976, and it now gets reissued once a year.

* * *

Things You Wouldn't Know If You Didn't Listen to the Radio #1. According to a news report of goings-on in the legislative session, "The proposed bill would require the governor to cut his staff members in half." Rather a Solomonic approach. #2. With the severe winter in northern New Mexico, the 6:30 a.m. newscasts now carry the word that "Los Alamos is open today." That's news? Reminds me of the captain and the first mate, each of whom kept the ship's log for a week. Came a day when the mate showed up inebriated. The captain dutifully reported in the log that "The first mate was drunk today." And plead though the mate might, the captain was adamant: "The log contains the truth!" So when it came the mate's turn to keep the log, he wrote, "The captain was sober today." ●BH

* * *

El que mucho duerme poco aprende. ("He who sleeps a lot learns very little" -- the current motto of 1100.)



LIVERMORE RETIREES (from left): Bud Clauson (8132), 28 years; and Morris Mote (8316), 27 years.

First Under New Program

Stratton Going to Bell Labs

Dick Stratton (9013) has been named MTS Department Head, Government Systems Division, AT&T Bell Labs, Whippany, N.J., effective March 1. This transfer is the first one to Bell Labs under a new AT&T Interchange Agreement, which expands the opportunities for other Sandians to become a part of Sandia's parent company. In Dick's case, the transfer involves a promotion from division supervisor to the equivalent of a Sandia department manager.

"I suppose this makes me something of a trail-blazer," says Dick. "I'm certainly looking forward to my new post. After all, Sandia and Bell Labs share common interests, so all of us involved believe that the move will benefit both organizations."

The specific common interests in this case include ASW (anti-submarine warfare), a longtime Bell Labs program and an area in which Dick has worked for years at Sandia. So it's a natural match. Incidentally, Dick will be working in a group headed by Al Narath, who left his Executive VP post at Sandia in 1984. Dick will have the equivalent of two small Sandia divisions reporting to him, but the department is expected to grow.

"We're a bit concerned about adjusting to the New Jersey climate and the cost of housing," says Dick. "But the excitement of new places to visit, new sights to see, and, in the case of Teddy, my wife, new musical groups to join [Teddy is a member of the NM Symphony Chorus and has sung in many ACLOA productions] more than makes up for any negatives." Whippany is some 15 miles northwest of Newark, which puts it within easy driving distance of New York City.

Dick came to Sandia in August 1969 as an MTS in the Exploratory Weapons Systems Directorate. He has remained in the same area as a systems analyst working on weapon systems studies. In July 1979, Dick was appointed supervisor of Systems Studies Division III. That division became Naval Systems and Air Defense Division 9013 as the work focused on naval systems.

Dick has a BS and an MS in EE from Brigham Young University. He received his PhD in EE and systems science from Michigan State University. In his spare time, Dick enjoys church and family activities, soccer, gardening, and photography. He and his wife Teddy have five children, four still at home.

"The transfer came about quickly," Dick concludes. "AT&T began talking with me about the new job in January, and we'll be moving to New Jersey in a month or less. It's an exciting time for all of us."

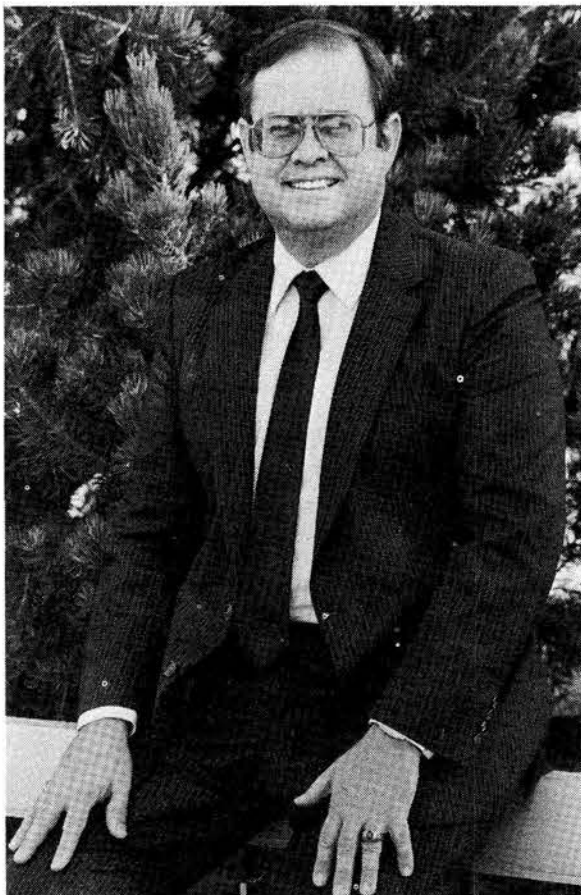
Death



Gloria Padilla of Supercomputers Systems Division 2641, was found dead March 2. She was 40 years old.

Gloria had been at the Labs since September 1975.

She is survived by four brothers and three sisters.



DICK STRATTON

Congratulations

To Allison (1813) and Terry Davis, a daughter, Christina Marie, Jan. 16.

To Roxanne and Keith (7813) Paulson, a daughter, Freyja Anastasia, Feb. 10.

To Debbie and Robert (7813) Kelley, a daughter, Amber Michelle, Feb. 12.

To Ann and Bob (1554) Croll, a daughter, Christiana Hope, Feb. 25.



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Soft Transfer

report to researchers working in CVD and, in particular, RDRs.

EMCORE researchers examined the report with great interest. The computer-generated flow patterns confirmed some of the streamlining that EMCORE workers had found in their own experimental apparatus. What's more, Greg's calculations were done in such a way that the results could be applied to a whole class of reactors, not just one.

Richard Stall, EMCORE's VP for Materials, later acknowledged Sandia's soft transfer of both experimental and computational research. He wrote about Greg's work to Wayne: "His report . . . has been a bible for us in interpreting results that we have observed through trial and error. Through our experimental studies of flow dynamics [in an RDR], we arrived at a specific reactor design to give minimal recirculation above the disk. Dr. Evans' calculations predict the same design!"

EMCORE used Greg's work in two major ways. "First, his relations between growth temperature, total flow, pressure, and rotation speed have been a guide to choosing growth conditions," wrote the EMCORE VP. "Secondly, as we have scaled the size of the disk for different applications, his work has provided a guideline [for] reactor design."

The analysis needed for understanding the reactor required more than 100 sets of calculations, each taking up to three hours of CPU (central processing unit) time on a Cray 1-S and using about 1 million words of memory. Greg was thus able to run a computational parameter study that would be difficult to do experimentally in a system that has so many variables.

It wasn't only the computational aspect of CVD methodology that Sandia shared with EMCORE. There was interchange on actual experimental work as well. Bill discussed with EMCORE his experimental observations of the flow patterns in an RDR prototype, which amounted to a "very desirable combination . . . of approaches," wrote the EMCORE executive. As a result, EMCORE changed the configuration of its reactor (by modifying some condi-



POINTING OUT a display to Greg Evans, Bob Kee (both 8245) shows the black-and-white shading that represents the temperature field in a rotating-disk reactor.

tions for its gas inlets), gained confidence in its product, and profited from Sandia's indirectly transferred technology.

Albuquerque, Livermore Share Data

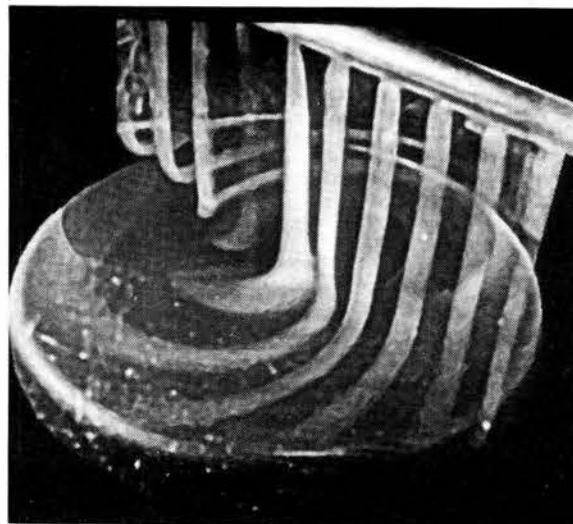
In addition to the computer models of CVD, other large computer programs developed at Sandia were used to help understand the chemistry occurring in a CVD reactor. Carl Melius (8343) and Steve Binkley (8250) developed programs to predict the thermodynamic properties of molecules that are important in CVD processes, and provided theoretical guidance on probable reaction mechanisms.

The computer model for CVD and the chemical properties programs were extensions of research on the fundamentals of combustion at Sandia Livermore's Combustion Research Facility. The CVD program at Sandia Albuquerque benefited by the internal transfer of technology from one basic research project to another.

Conceptual Technology's Crucial

Sandia already houses several generations of CVD reactors. And American industry needs to create ever newer generations in the years ahead.

"From an engineering point of view, we're straining the limits of fabricating microelectronic cir-



GASES FLOW in a spiral over a rotating disk in Div. 1126's reactor. The picture was taken with a Polaroid after injecting streamers of smoke into the gas and sending across scattered light from a laser. In the CVD process, unstable chemicals go in, undergo reactions with the gases, and leave solid film. The circulating streamlines in Bill Breiland's (1126) experiment were confirmed by the mathematical calculations of Greg Evans (8245).

cuits," says Wayne. "The demands on processing technology are increasing — toward higher levels of component integration and greater speeds — and so are the constraints."

"The crucial, identifiable contribution will be conceptual technology that will allow the U.S. to compete effectively with the rest of the world," Wayne continues. He doesn't think the fast-paced industry in Silicon Valley can afford to search for a basic understanding. And, if it did, the solutions would be "hot" — therefore, proprietary.

"This is where Sandia, as a national laboratory, has a definite role to play," Wayne says. "Our research can benefit the entire U.S. industry." ■ID

Basics First

The transfer of CVD reactor technology to EMCORE (see "Some Tech Transfers are Softer" story) is an outgrowth of a Sandia CVD research program started in the late 70s by Wayne Johnson, supervisor of Laser and Atomic Physics Division 1126.

"CVD is the process of choice for deposition of all the thin films used to make microelectronic circuits," says Wayne. "The growing importance of this technology was recognized early by BES/DOE, which has supplied the basic funding for our program."

"Even though CVD reactors are in commercial production today, the fundamental understanding of the process is still in its infancy," says Bob Kee, supervisor of Computational Mechanics Division 8245. "But the combined computational modeling and experimental program at Sandia is making significant progress toward understanding and controlling this process."

"Sandia gives its researchers the leeway to gain a very detailed understanding of basic processes from a molecular point of view," says Bill Breiland (1126). "CVD is an art. It's been used for about three decades in engineering applications without being understood: turn knobs until a desired effect is achieved. What we have done at Sandia is to study CVD systematically, applying the fundamental laws of chemistry and physics."

Understanding the Chemistry

Pauline Ho (1126) and Bill have used laser-based techniques to measure gas-phase temperatures and the concentrations of various chemical species during the deposition process.

Although the laser-based probes generate very detailed data about the gas-phase chemistry, interpreting the data required extensive theoretical analysis. In support of that work, Mike Coltrin (1126), Bob Kee (8245), and Jim Miller (8353) developed a set of computer models that describe the combined effects of fluid flow, gas-phase chemistry, and surface chemistry in a CVD reactor. Their work enables the details of the experimental measurements to be understood.

They've already received some recognition. In 1984, Bill, Pauline, and Mike received the BES Materials Sciences award for the Outstanding Scientific Accomplishment in Materials Chemistry — for their work, entitled "Fundamental Mechanisms of Chemical Vapor Deposition."

Sympathy

To Bill Wolfer (8341) on the death of his brother in Jettingen, West Germany, Jan. 26.

To Darryl Beers (8316) on the death of his brother in San Antonio, Tex., Feb. 11.

To Roy Lee (8233) on the death of his wife in Livermore, Feb. 19.

To Carol Chappell (8133) on the death of her father in Macon, Mo., Feb. 23.

To Joan Madsen (8184) on the death of her mother in Livermore, Feb. 25.

CVD: The Process

The CVD process begins by passing an active gas — say, silane — over a substrate — a solid such as silicon — heated to about 1000 K. As the heat is transported away from the substrate by a fluid motion, the active gas changes chemically to form molecules that are very reactive on the substrate surface. Upon reaction, a film is deposited on the surface of the substrate.

In the RDR, the heated substrate spins (about 1000 rpm) in a cylindrical chamber through which the active gases flow. This arrangement has an important property: For certain conditions, the gas species and temperature gradients at the substrate are highly uniform even though the gas motion consists of a three-dimensional, swirling flow. As a result, the deposition is very uniform.

"What's good about highly uniform composition is that many microelectronic devices, such as computer chips, can be grown on the wafer and still have identical characteristics," says Greg Evans (8245). "The RDR has the potential for doing that very well."

"But you have to know a few things about flow patterns — for example, how fast to spin the disk and how rapidly to let in the gas — to get good chips," Greg concludes. "Such information is very practical for a company like EMCORE."



**SANDIA
LIVERMORE NEWS**

Sandia in Superconductivity Race

273.16 degrees below 0 C) to perhaps 23 K — that few applications were practical.

But if the temperatures at which superconductivity can be maintained are high enough — still very cold but well above 0 K — then electricity can flow through a conductor with a resistance so low that

for all practical purposes it doesn't exist; once begun, the current just keeps flowing even though the superconductor is removed from a power source — as long as temperatures are below the superconductor transition temperature, above which the superconducting property is lost.

Generally, "high enough" temperatures mean those above liquid nitrogen, that is, 77 K. Liquid nitrogen is attractive because it's efficient as a cooling mechanism and because it's cheap — about a nickel a litre (slightly more than a quart), which is

(Continued on Next Page)

Superconductivity: Historical Perspective

Research in superconductivity has made faster progress in the past three months than in all the previous 75 years since the phenomenon was discovered. That discovery was in 1911 by Dutch physicist Heike Kamerlingh-Onnes, who received the Nobel Prize in Physics two years later.

From 1911 until December 1986, the warmest temperature at which superconductivity was known to occur had risen only to 23.3 K, or 23.3 degrees C above absolute zero. Now — at least as of late last week — the figure suddenly has jumped to about 94 K, the figure obtained by Sandia scientists on March 3 (see "Sandia Now in Race" story), confirming work reported by scientists from the University of Houston and the University of Alabama. No one expects it will stay at that point for long.

Low-Temperature Barrier Broken

The road to higher-temperature superconductivity has suddenly been freed of all apparent scientific and psychological obstacles. It is a dramatic development for a field that had long been thought to apply only to the lowermost temperatures obtainable by cryogenic (low-temperature) techniques.

Kamerlingh-Onnes showed that the electrical resistivity of a mercury wire suddenly disappears when it is cooled below a temperature of 4 K, the temperature of liquid helium. It was a completely unexpected discovery.

Soon thereafter, he found that passage of a sufficiently large current or application of a sufficiently strong magnetic field can cause the material to return to normal conductivity. In 1933 another property of superconductors was discovered: They are highly diamagnetic, which means they expel a magnetic field. (Today diamagnetism is one of the several tests, in addition to zero electrical resistance and demonstrated current-carrying ability, that demonstrate a material is truly superconductive.)

Nobel Prizes for Theory

This discovery led to some theoretical advances in understanding, but it wasn't until 1957 that a fundamental theory of superconductivity was presented. This work by the American physicists John Bardeen, Leon Cooper, and Robert Schrieffer brought them the 1972 Nobel Prize. (It was the second Nobel Prize for Bardeen, who was also co-inventor of the transistor while at AT&T Bell Labs.) The theory is now known as the BCS theory (for them), and most theoretical work since then is based on it.

Another Nobel Prize for superconductivity-related research was won by British physicist Brian Josephson in 1973 for a prediction in 1962 (later verified) that two superconducting objects placed in electrical contact would display certain novel electromagnetic properties.

Theoretical advances since then have brought better understanding of the detailed properties of many known superconductors. But they gave little guidance to scientists searching for materials that would be superconductive at higher temperatures.

"The BCS theory is beautiful and descriptive," says Jim Schirber, manager of Solid State Research Department 1150 and one of five Sandia scientists who last week demonstrated 94 K superconductivity, "but unfortunately it is practically nonpredictive."

This accounts for the current frenzy of experimental efforts at many labs worldwide, including Sandia, now that temperature barriers once thought to be insuperable have been broken through.

Dramatic Developments

What happened to bring things to this extraordinary state?

The behind-the-scenes story of the extraordinary developments of the past three months will someday make a fascinating case study in the history of science. (There are reports of a temporary but key "typographical error," possibly intentional, in specifying the superconductive compound in manuscript form, to ensure against its premature revelation; and of threats of suits against journals that might allow key details to be disclosed via the refereeing process.)

For now, the publicly known developments are dramatic enough.

"The seminal paper came out last year by the Swiss," says Jim Schirber. Two scientists, J. G. Bednorz and K. A. Muller, at IBM's Zurich laboratory (the same laboratory where the scanning tunneling microscope was developed that earned the 1986 Nobel Prize) reported in a European physics journal a possible 30 K superconductor. "Probably most people didn't see it or believe it," he says.

Then Japanese scientists picked up on the development and showed that the material was indeed a good superconductor at 30 K. They let the word out at the Materials Research Society meeting in Boston in early December.

Jim says Sandia had several scientists at the meeting but none happened to attend that particular session. There are numerous concurrent sessions, and there just was no reason to expect anything important about superconductivity to be reported.

Several other labs did have people in that session, and they all went back and quietly tried to improve on the discovery.

The material that had been found to be superconducting at 30 K was a compound made of lanthanum, barium, and copper oxide. The specific formula was $\text{La}_{1.85}\text{Ba}_{0.15}\text{CuO}_4$.

One scientific group hard at work on the topic was led by University of Houston materials scientist C. W. Chu. By Dec. 15 the group had evidence for superconductivity above 40 K at high pressure in the lanthanum-barium-copper-oxygen system and a paper announcing these results in the offices of *Physical Review Letters*.

Also working fast, R. J. Cava and colleagues at AT&T Bell Laboratories had found superconductivity at 36 K in the lanthanum-strontium-copper-oxygen system. Both papers were published in the Jan. 26 issue of *Physical Review Letters*.

The Chu paper included a note added in proof on Jan. 6 stating that collaboration with a group led by M. K. Wu (one of Chu's former students) of the University of Alabama had found that the replacement of barium by strontium produces a transition to superconductivity at 42 K. It also indicated finding sharp drops in resistance, although not to zero, at still higher temperatures.

But word about Chu's advance got out well ahead of publication.

Jim Schirber was sitting at home during Sandia's holiday break when he heard the news. He recalls it this way: "My wife was reading the paper. 'What's this about a 40-degree supercon-

ductor?' she asked. 'Baloney!' I said (or explicit words to that effect). 'AT&T has it too,' she added. 'What?' I shouted."

With the holiday break over on Jan. 5, Jim quickly consulted with Bill Brinkman (1000), and both began calling their colleagues back East, who confirmed the gist of these reports but would give few other details before publication.

The Sandia research group immediately went to work (see "Sandia Now in Race" story).

In the meantime Chu's group continued its assault on the superconductive barriers. The Jan. 30 *Science* carried the group's report (received by *Science* on Dec. 30) of a transition to superconductivity at 52.5 K in a pressurized lanthanum-barium-copper-oxide compound.

Last Month's Breakthrough

Then on Feb. 16 came an announcement from the National Science Foundation (where Chu also is associated with the NSF Division of Materials Research) that the collaboration of Chu's and Wu's groups had made a material that becomes superconducting at the astonishing temperature of 98 K. The announcement received worldwide news attention.

This was an achievement that even conservative scientists and science publications refer to by that rarely appropriate label "breakthrough." All earlier superconducting transitions began only at temperatures much colder than that of liquid nitrogen, 77 K. But a material that can be made to have zero electrical resistance merely by cooling it with liquid nitrogen represents an advance of potentially historic proportions.

The NSF announcement purposely gave few details. Chu and Wu refused to describe the compound in detail until two papers submitted to *Physical Review Letters* on Feb. 6 (revised on Feb. 18) could be published. In the meantime Chu had filed a U.S. patent application on the material on Jan. 12.

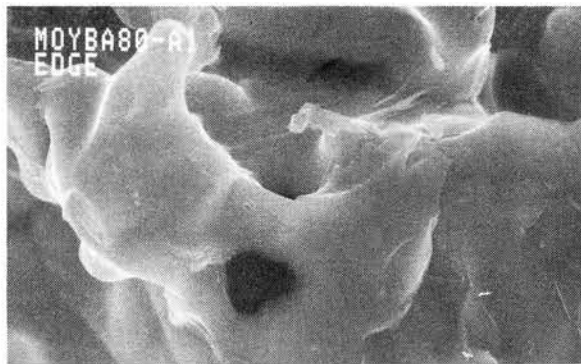
No one could learn what the material was. At Sandia, and presumably at other labs around the world, a variety of compounds and formulations were tried. None worked.

With a publication rapidity exceedingly rare in science, the reports by the Houston and Alabama groups appeared last week in the March 2 *Physical Review Letters*. The key difference between this compound and the earlier ones was the element yttrium. The new compound, whose superconducting transition was now stated to be between 80 and 93 K, was a compound of yttrium, barium, and copper oxide. Specifically, $\text{Y}_{1.2}\text{Ba}_{0.8}\text{CuO}_4$ is the starting composition.

"For the first time," reported the scientists, "a 'zero-resistance' state . . . is achieved and maintained at ambient pressure in a simple liquid-nitrogen Dewar." That was preceded by an opening statement clearly evoking the achievement's potential significance:

"The search for high-temperature superconductivity and novel superconducting mechanisms is one of the most challenging tasks of condensed-matter physicists and materials scientists. To obtain a superconducting state reaching beyond the technological and psychological barrier of 77K, the liquid-nitrogen boiling point, will be one of the greatest triumphs of scientific endeavor of this kind."

•Ken Frazier (3161)



SCANNING ELECTRON MICROGRAPH of new superconductor material is one of several analytical techniques Sandia is using to gain a better understanding of the yttrium-barium-copper oxide material. Dick Baughman (1144) took this shot at 2500 enlargement.

(Continued from Preceding Page)

Superconductivity

not much more expensive than water, and infinitely abundant — 80 percent of the earth's atmosphere is nitrogen. (Liquid helium is much colder, about 4 K, but much less efficient as a coolant and much more expensive.) "It's achieving superconductivity with liquid nitrogen that's really the spectacular breakthrough," notes Schirber. "It's what had to be done to make superconductivity economically significant. Improvements above the current 94 K [achieved by other researchers and now confirmed by the Sandia team] are gravy."

Easily achieved superconductivity would be a major advantage, it's believed, in power transmission (a significant amount of power — some say as much as 40 percent — is lost from the lines connecting a generating plant and the power user, but if the lines ran inside buried tubes filled with liquid nitrogen, losses would be minimal); in stationary power generators; in storing magnetic energy indefinitely; in levitating a train, say, above its rails (thus eliminating friction); in reducing the costs for the proposed

Brinkman, Vook on Effort

Seldom has any scientific field been turned upside down so rapidly as the recent surge of advances in achieving superconductivity. And both Bill Brinkman (1000) and Fred Vook (1100) are excited. "The whole worldwide effort is an incredible breakthrough," says Bill. "It seems as if we've been stuck at 22 or 23 K forever, but we're now moving by leaps and bounds."

"I think Jim Schirber and his group have really rallied to join the revolution," Bill concludes. "They've done a great job of getting on board."

"What we've done here at Sandia in a few short weeks is simply unprecedented," says Fred.

"What most scientists would have considered pie in the sky a few months ago is now a reality. It's just amazing."

"Sandians can be quite proud of the materials science capabilities we have here, as demonstrated by our ability to synthesize these new superconducting materials so rapidly," Fred continues. "There's a lot more work to be done, but the economic potential is exciting."

"And the effort, both worldwide and at Sandia, is definitely a watershed, a breakthrough in the real sense of the word!"

Superconducting Supercollider, the next generation of high-energy physics research accelerator (and making research accelerators such as PBFA II more efficient in terms of power consumption); and in opening new research frontiers no one has yet postulated.

A potential application exciting to Sandia would be linking the zero resistance at 77 K with the high-speed strained-layer semiconductor for even faster and more efficient devices.

The Sandia Contribution

Although Sandia has worked for years in organic superconductivity, the Sandia team is a relative latecomer to the superconductivity race that's now on in probably a hundred labs and universities around the world. But it's moving up fast. "Three months ago, we, and everyone else, could achieve superconductivity at 22 K; in early January it was 40 K; as of last week we've achieved 94 K, with promise of moving yet higher," says Jim.

The key to the sudden breakthrough is a new combination of materials. The January-February progress came from a mixture of lanthanum, barium, and copper oxide. On Tuesday of last week the Sandia scientists had the key parts of the published report read to them over the telephone from early recipients of *Physical Review Letters* on the East Coast and learned that yttrium had replaced lanthanum in the compound. That same day the Sandia team made the yttrium compound and, after suitable annealings, that night demonstrated it was superconductive between 93 and 94 K.

"This is what three months ago everyone would have told you was impossible," says Dave Ginley. "Now we don't see any barrier."

What wasn't mentioned in the article was the exact recipe for mixing the constituents, or the best way to mix them. It's a complicated process, but Sandia had an unusual advantage: The Labs has been developing new ways to create and analyze ceramic-type materials, which these are, since the 60s. (The PLZT work done by Cecil Land, 1112, and former Sandian Gene Haertling — see LAB NEWS, July 3, 1986 — was an outgrowth of that work in ceramics.)

And both Solid State Sciences 1100 and Materials and Process Sciences 1800 directorates are skilled at pioneering work in creating sophisticated materials by sintering, annealing, high pressure, melting, thin film application, and other means. (A patent disclosure or two are under way, so full discussion isn't possible here.)

"We have three goals," says Dave Ginley. "We're continuing to make progress in raising the T_c , that is, the temperature at which superconductivity can be achieved in the new material. We're developing new ways to create or process the material. And we're working toward understanding the physics that underlies the effect so we can improve its superconductive properties, though we're a long way from success there — no one really knows the mechanism of this superconductivity."

"It's really kind of fun," says Dave, who makes the material samples. "You try anything. You're not constrained because you don't know the mechanism. No one is getting there by sophisticated thought."

Currently, the most promising recipe for the new material is $Y_{1.2}Ba_{0.8}CuO_4$; that is, yttrium, a metal that looks like steel but is lighter and more expensive (a bag of yttrium "marbles" that fits easily

in the hand costs about \$1000); barium, a metallic element of the alkaline-earth group; and copper oxide, which appears to be the base of the material.

Each completed sample of the material must then be tested for superconductivity and for magnetization. "First you check the resistance reading of the material at room temperature," says Jim Schirber. "Then you cool it with liquid nitrogen and check it again. If the resistance reading drops to zero and it approaches perfect diamagnetism [expels magnetic fields], then you've got a superconductive material. Both criteria must be satisfied."

"You also check the critical current, that is, the amount of current it takes to cause the material to return to normal, or flip out of the superconductive state," Jim continues. "Obviously, you want that to be as high as possible. So far, critical currents have been small, both for us and for other researchers. But that may be just a material processing problem."

"Growing a single crystal of the material might improve the critical current, and many labs are working on that," Jim concludes. "It's a big effort in the field." Sandians such as Dick Baughman (1144) and Paul Nigrey (1152) are skilled at growing single crystals of complex materials, so their work may lead to some further advances. ●BH

How Cold is Cold?

Three Ways to Measure Temperatures

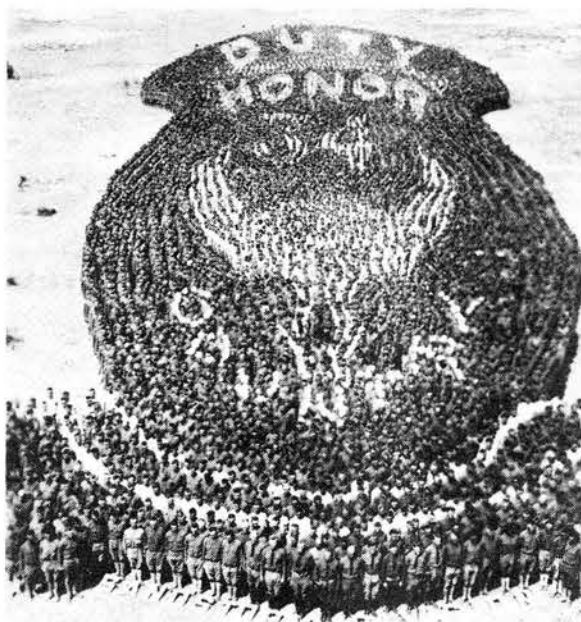
Americans generally measure weather temperatures in degrees Fahrenheit, in which water boils at 212 degrees F and freezes at 32 degrees F. The system is named after the German scientist G. D. Fahrenheit. In 1714, he set zero at the lowest temperature he knew how to achieve in the laboratory (by mixing ice and common salt), the human body temperature at 96 degrees (it's now considered 98.6 degrees), and boiling water at 212 degrees.

Science and technology worldwide — and average citizens in most other countries — use the Celsius scale (once known as the centigrade but changed in 1948 to avoid confusion with the hundredth part of a grade). The scale is named after Swedish astronomer Anders Celsius (1701-1744), who divided the interval between water's ice point and steam point into 100 parts. (Ironically, he inverted the scale; that is, he set the ice point at 100 degrees C, the steam point at zero.)

A Kelvin is equal to a degree Celsius in magnitude, but its zero equals absolute zero, the temperature at which all molecular motion is suspended (and never actually achieved, though the science of cryogenics has come within a fraction of a Kelvin). Zero K is the same as minus 273.15 degrees C. Named after Lord Kelvin (1824-1907), the system's former name, *degrees Kelvin*, became obsolete by international agreement in 1967.

The 94 K achieved by the University of Houston researchers and confirmed at Sandia and elsewhere thus represents, for the average person, a mere minus 290 degrees F.

Favorite Old Photo



AFTER THE U.S. entered WWI, the Minnesota National Guard was mobilized and sent to Camp Cody, N.M. (near Deming). Before the troops were sent overseas, they were turned out in the formation of their emblem, the 34th Division. My father, Louis Barnaby, sent the photo to his parents with a note saying, "I'm somewhere in this picture; find me." Bruce Barnaby (7242)

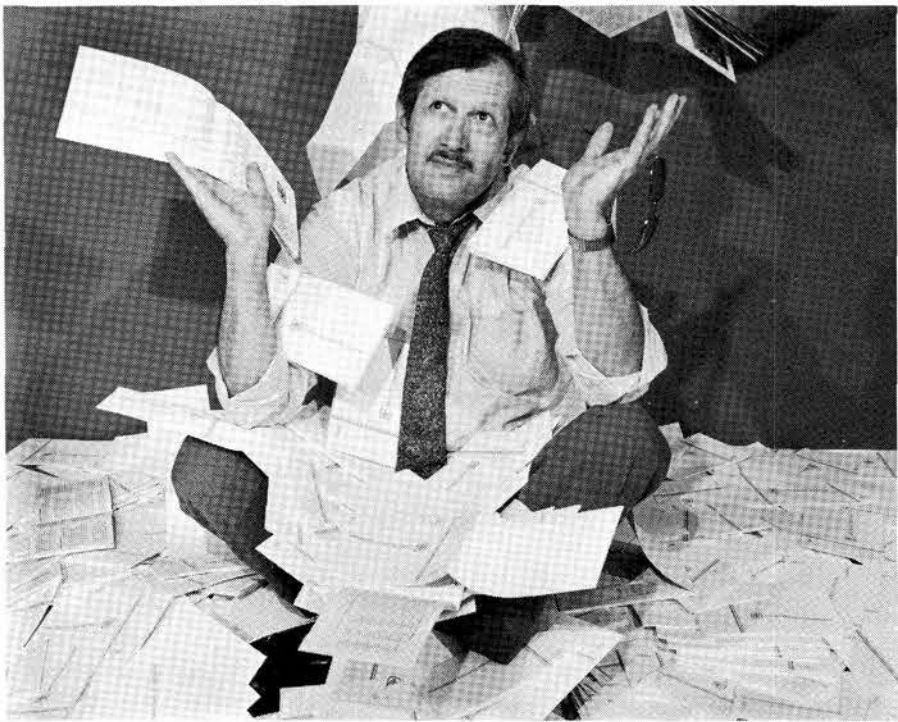
Honk If You See Danger



Mother Goose Security Systems markets a \$29.95 early-warning system of two geese who honk at strangers. "They require no installation and low maintenance," says the Stoneham, Mass., company, which got the idea from use of "sentry geese" by the U.S. Army.

Wall Street Journal

BOOKLETS, BOOKLETS EVERYWHERE, but the glut will diminish, starting today. Larry Perrine (3161), the Sandia information booklet's current compiler, is mailing a copy to each Sandia organization. See the story for how to get your own.



Get A Copy, Be an Ambassador

Little Blue Book Out Today

If you want to know all about Sandia, then ask a Sandian, right?

Well, not necessarily.

Few of us have at our fingertips the basic facts and figures it takes to answer logical and legitimate questions that outsiders often have about the place.

Fact is, our fellow residents in Albuquerque, Livermore, and various points in Nevada probably harbor nearly as many misconceptions as facts about the Sandia facility in their midst. Guards, gates, and rumors do little to clarify the Labs' mission, capabilities, and importance to the communities it calls home.

Enter the little blue book. Well, it's not really blue, but it has "Sandia-blue" print on the cover. And it's not really a book — more a booklet. But it is little — half the size of a sheet of paper and 20 pages long. It's simply called "Sandia National Laboratories," and the 1987 issue just rolled off the press.

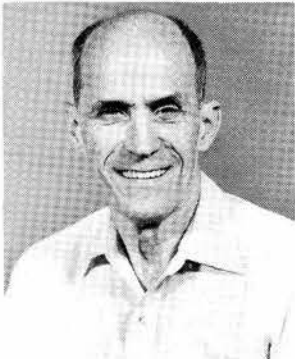
That little blue book is a distillation of basic info about the Labs, both general — how big we are, what we do, how many people work here, what facilities we have — and program-specific — nuclear weapons, verification technology, other weapon systems, pulsed-power research, SDI, energy. Briefly, of course. And it ends with a summary of technology transfer activities and tables on budget, payroll history, plant assets, technical capabilities, and so on.

Although the booklet has been available for years to employees (and to retirees and other folks outside the Labs), "we're pushing it a bit more this year," says Art Davie, VP Administration 3000. "One reason is that we know that our best ambassadors to the outside world are our employees, and we know they want outsiders to have the most accurate, releasable information possible about Sandia.

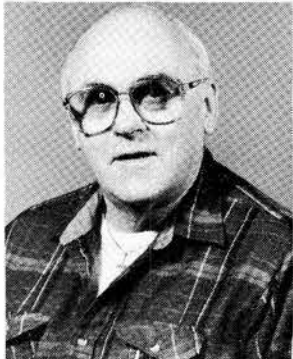
"Another reason is that making the booklet available is a step in the continuing effort to improve communications within Sandia," continues Art. "Knowing the 'basics' about the Labs is a good starting point. Everyone shares the same common information."

First look at the '87 booklet is today when its current compiler, Larry Perrine of Public Information Division 3161, in cooperation with the Mail Room, sends the booklet to all Sandia supervisors. They are encouraged to pass it around to employees in their groups.

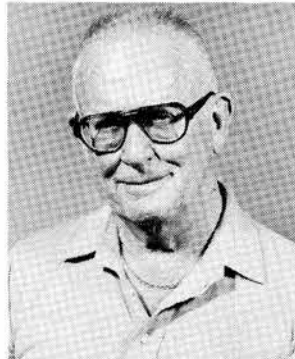
However, if you can't wait for the circulation copy and want your very own, send a self-addressed internal mailing envelope (9" x 12") to Div. 3162 (no phone calls, please) or pick up one in the Visitor Center (Bldg. 852) or in the lobby of Bldg. 800, 807, or 822/823 (in Livermore, from Personnel in Bldg. 911).



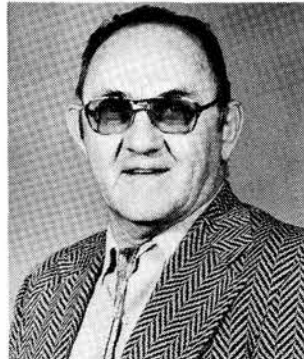
Don Ritter (2853)



20 Joe Bradshaw (7124)



31 Jack Benson (7251)



31 Jay Davidson (3411)



EXPLORING THE WAYS to strengthen relationships between AT&T and Sandia is Morry Tannenbaum (right), a Vice-Chairman of the Board of AT&T. "With Sandia's management, I'm helping to search out commonalities that we can foster for our mutual benefit," he explained during his visit last week. "We want to encourage the staffs of both companies to communicate with each other, and even to consider transferring — the best way to move knowledge often is to move people." Morry hasn't visited Sandia since the early 70s, but he's known all the Sandia presidents since Monk Schwartz (1960-66), Irwin Welber for 25 to 30 years. Morry also took a helicopter tour of Coyote Canyon Test Complex with VP Bob Peurifoy (7000, left, upper photo) and Dave Bickel, supervisor of Track and Cables Division 7535.



Welcome

Albuquerque

Robert Bell III (7541)
Lynn Llull-Kaczor (3144)
Virginia Moore (3545)
Tonya Wichhart (132)

Arizona

Stephen Becker (2336)
Bart Bradley (5261)

Indiana

Terence Koepp (2335)

New Mexico

Carol Skinner (2311)

Texas

Roy Hogan (1513)
Edward Parma, Jr. (6421)

Utah

Terry Montague (2532)

Washington

Roger Breeding (6411)

Retiring

Supervisory Appointment

Black Leaders Meet at Labs



TOM YOUNG to manager of Electronic Process Development and Fabrication Department 7410, effective Dec. 16.

Since he joined the Labs in June 1962, Tom has worked in the Component Development organization on development of explosive power supplies, radioisotopic power supplies, crystal components, and radiation-hardening techniques. In March 1974 Tom was appointed supervisor of Special Test Equipment Division 2341. He was supervisor of Crystal Components Development Division 2534 when promoted.

Tom came to Sandia after he graduated from Kansas State University with a BS in EE. He was a member of the Technical Development Program and earned an MS in EE from UNM. Under the Labs Educational Aids Program, he earned a second MS from UNM in nuclear engineering.

Tom is a member of IEEE. Off the job he enjoys music, skiing, backpacking, and church activities. Tom and his wife Joan have two children and live in NE Albuquerque.



THREE MTSs, ONE MLS describe how they prepared themselves for careers at Sandia. From right, Ivory Alexander (2612), William Brown (1533), Cynthia Harvey (7841), and Basil Steele (5249) discuss supportive ways of preparing youth for careers in science and engineering. "Serving as role models and encouraging kids to get good grades in school early on are probably the most important," says Patricia Salisbury (3510), conference coordinator. The organizers of Black Leaders' Day chose "Working for a Better Future" as the day's motto.



ANNIE BELL, president of Black Federal Employees, gives the centrifuge a push. The Black Leaders' Day agenda at Sandia included a tour of the Environmental Test Facilities in Area III and PBFA II.

AT&T Savings Plans

The following are the Earnings Factors as of Nov. 30 and Dec. 31, 1986, for the AT&T Savings Plan for Salaried Employees (SPSE), AT&T Savings and Security Plan for Non-Salaried Employees (SSP), and the AT&T Voluntary Contribution Plan (VCP).

	Earnings Factors	
	Nov. 30	Dec. 31
SPSE(Savings Plan for Salaried Employees)		
AT&T Shares	1.0908	.9322
Government Obligations	1.0083	1.0049
Equity Portfolio	1.0279	.9761
Guaranteed Interest Fund	1.0088	1.0091
Diversified Telephone Portfolio		
Unrealized Appreciation	1.0423	.9670
Realized Appreciation	.0000	.0087
SSP (Savings and Security Plan - Non-Salaried Employees)		
AT&T Shares	1.0911	.9313
Guaranteed Interest Fund	1.0091	1.0093
Diversified Telephone Portfolio		
Unrealized Appreciation	1.0426	.9672
Realized Appreciation	.0000	.0089
VCP (Voluntary Contribution Plan)		
AT&T Shares	1.0918	.9316
Mutual Fund Equity Portfolio	.9892	.9964
Money Market Fund	1.0046	1.0048
Guaranteed Interest Fund	1.0090	1.0093
Diversified Telephone Portfolio		
Unrealized Appreciation	1.0418	.9670
Realized Appreciation	.0000	.0084



Here are a few current volunteer opportunities for employees, retirees, and family members. If you would like more information, call Karen Shane (3163) on 4-3268.

BETTER BUSINESS BUREAU needs volunteers to serve as arbitrators to settle consumer-business disputes informally, privately, and finally. When a business and its customer agree to arbitrate a dispute, the BBB asks them to sign a contract that permits a community volunteer (acceptable to the business and the customer) to conduct a fact-finding hearing and make a final decision in the matter. Training sessions will be offered from 6-10 p.m. on Wednesday and Thursday, March 25 and 26. Attendance is required at both sessions.

EASTER SEAL SOCIETY is starting a Friendly Visitor/Caller program that matches volunteers who visit or phone to disabled people (ages 21-54) who are homebound or in nursing care facilities. The program is recreational and will also offer monthly activities to all participants.

Emergency!

Crisis Management Team Rehearses Response

The situation: For unknown reasons, a Sandian takes three co-workers hostage in an Area V facility. The question: how to resolve this risky and potentially life-threatening situation? Enter: the Labs' emergency response team.

It all happened recently. Fortunately, the situation was only a practice exercise for key players who would respond in the event of a real on-premises emergency. The exercises, held period-

ically, call for split-second decision making. They're realistic, they're serious. And afterward, team members size up their performance: what was done right, what wasn't; what needs to be changed, what doesn't.

These photos, taken during a recent exercise in the new Crisis Management Room in the Bldg. 801 basement, catch the charged atmosphere as team members respond to the above scenario. Rep-

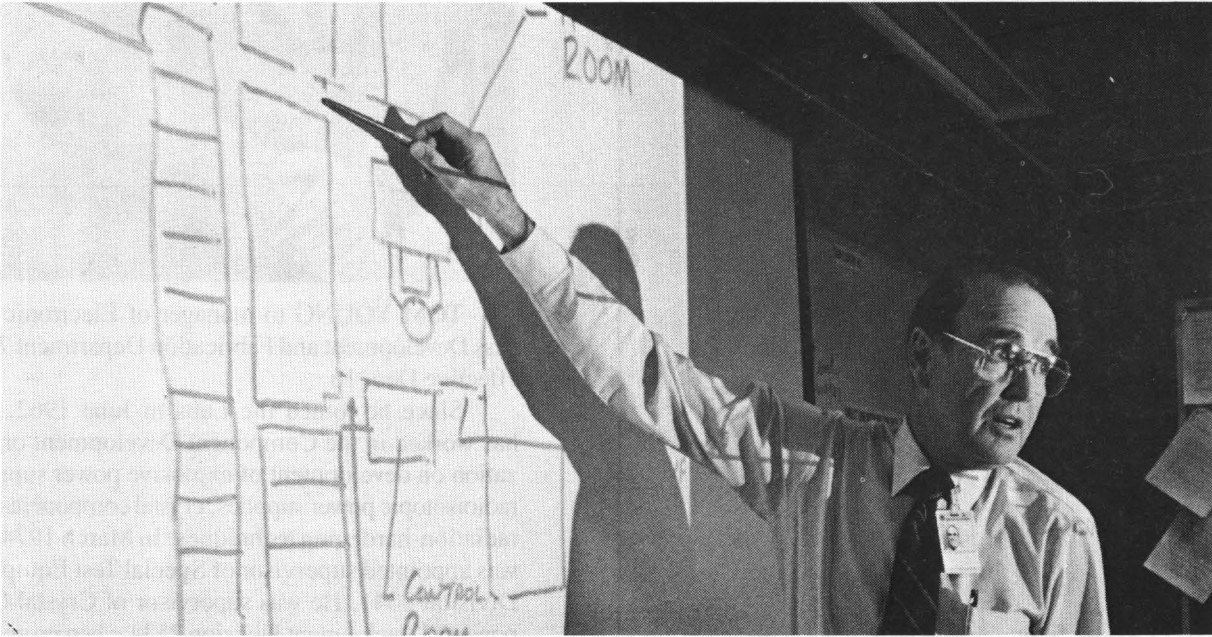
resentatives from the medical, environmental health/safety, plant engineering, and security organizations are on the team, as well as DOE/AL and FBI employees. People from public relations and personnel play key support roles during an exercise. Labs top management reps lead the team. For this exercise, Irwin Welber (1) and Lee Bray (30) served as crisis manager and assistant crisis manager, respectively.



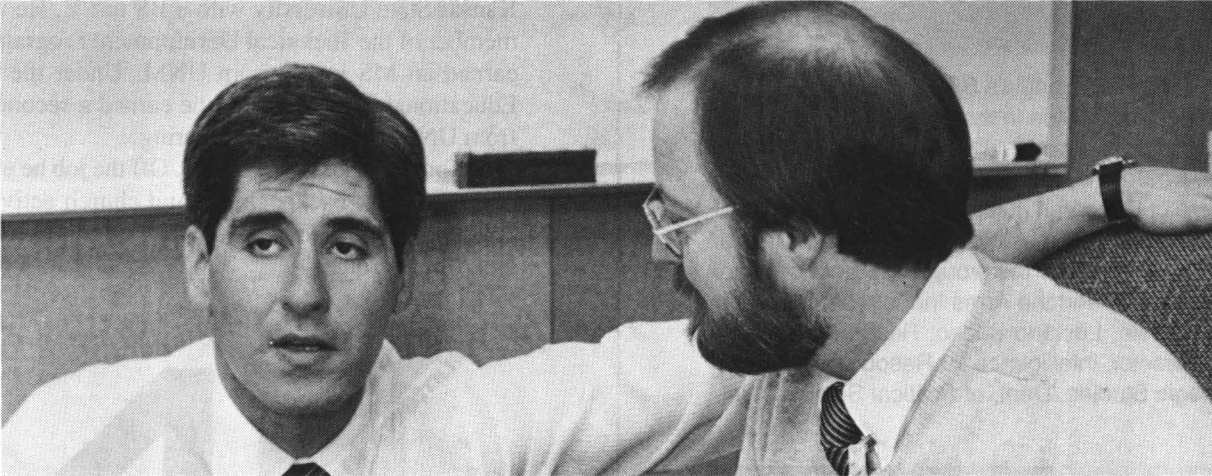
AROUND THE TABLE in the Crisis Management Room (CMR) are members of the Labs' emergency response team: (from left) Bill Burnett (3310), Ward Hunnicutt (7800), Vern Easley (7830), Jim Martin (3400), Bob Wilde (3430), Gerry Brown (3434), Lee Bray (30), and Irwin Welber (1). Special CMR phone system operates through PBX switchboard behind the table, at left. Security organization "controllers" (standing) make sure team members operate in productive and useful manner. VP Art Davis (3000), an observer at the exercise, sits at right, behind table.



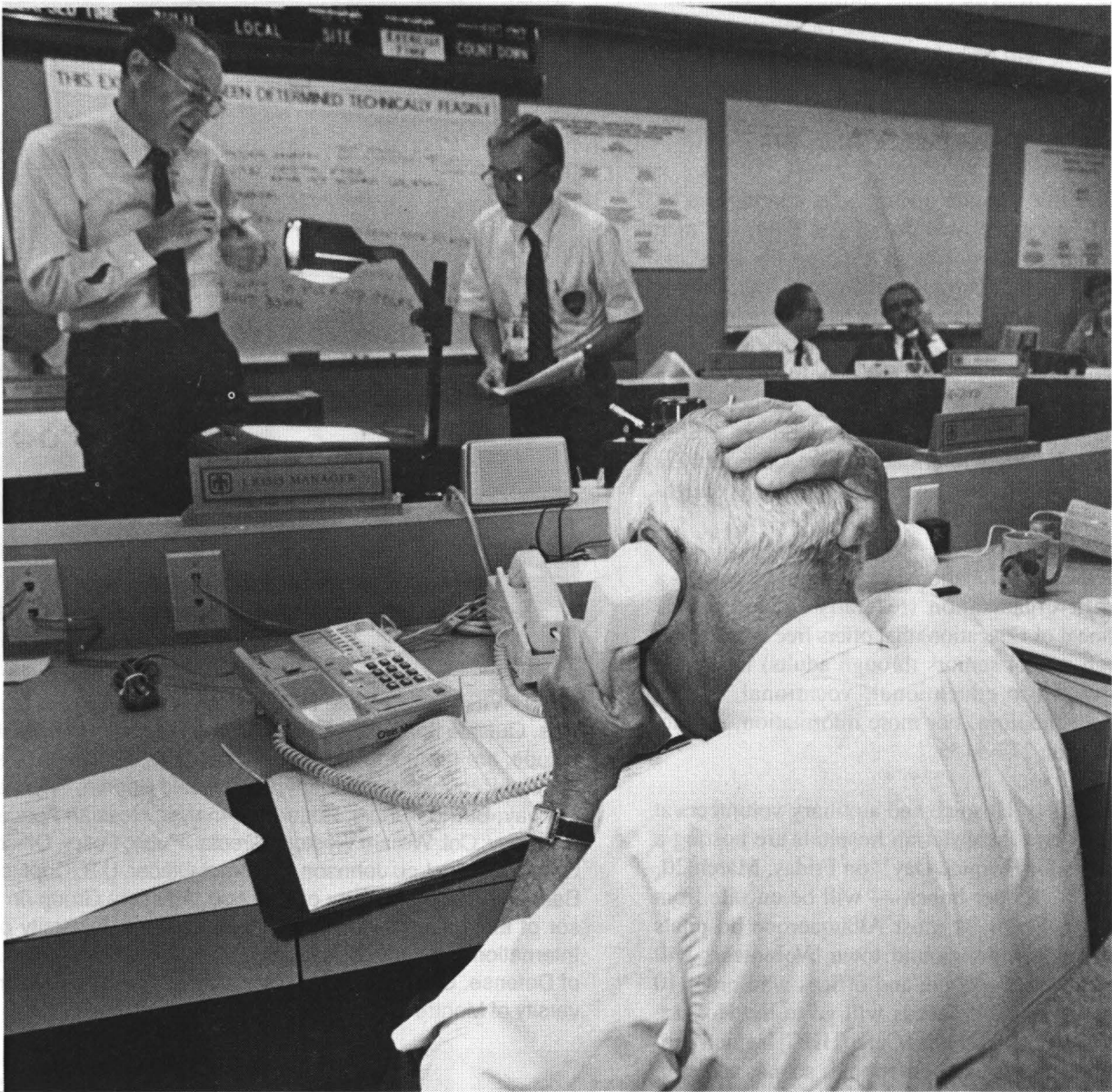
"IT'S BEEN A LONG DAY," says crisis manager Irwin Welber (1, right), as Gerry Brown (3432, left) phones the local FBI office. Lee Bray (30) concentrates on comment from another team member across the table.



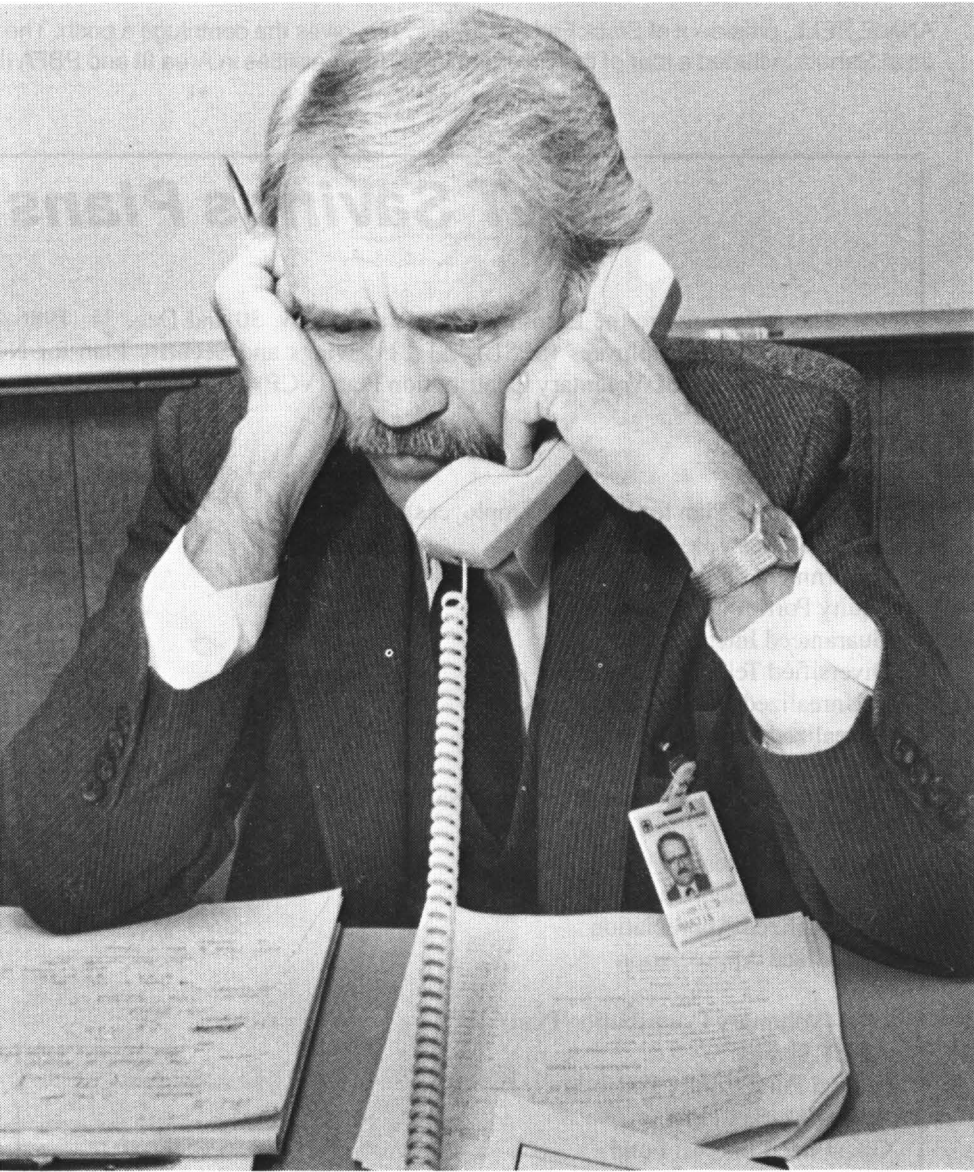
WARD HUNNICUTT (7800) describes layout of the crisis site so that emergency team can plan a response.



JAY SANCHEZ (3533, left) and Larry Clevenger (3320) talk over vital information on Sandians identified as "dead" or "injured" in Area V incident. Jay supervises the Personnel and General Employment Division, which is responsible for supplying background data to the emergency response team.



CRISIS MANAGER Irwin Welber (1) stays on phone with DOE/AL manager while Ward Hunnicutt (7800) and Bob Wilde (3430) get view-graphs of facility layout ready to show team.



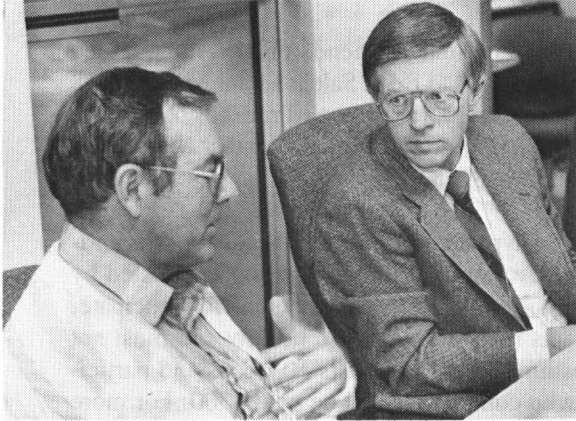
JIM MARTIN (3400) gets update on situation from on-scene security people. Jim's Industrial Relations and Property Protection Directorate — specifically, Safeguards and Security Services Department 3430 — coordinates emergency response exercises.



JIM MITCHELL (3160, second from left) goes over press release to be used in response to news media queries with team members (from left) Lee Bray (30), Irwin Welber (1), and Bill Burnett (3310). Members of Public Relations Department 3160 update press releases throughout the emergency, and are on hand to handle media inquiries.



A WORRIED Jim Martin (3400, left) and Bob Wilde (3430) talk to on-the-scene commanders and negotiators. In background, Rod Woy (3434) mans the PBX switchboard.



GERRY BROWN (3432), playing the FBI representative role, discusses strategy with assistant crisis manager Lee Bray (30). Gerry was with the FBI before he joined Sandia.



Take Note

Fred Norwood (1533) was elected president of the New Mexico Chapter of the Mexican American Engineering Society (MAES) for 1987-88 at the MAES quarterly meeting in Santa Fe.

* * *

Paul Percy (1140) and Jim Schirber (1150) were elected Fellows of the American Association for the Advancement of Science (AAAS) by the AAAS Council at the annual meeting Feb. 14-18 in Chicago.

* * *

Margaret Coy (131) has been named an International Director for the Data Processing Management Association for 1987. She is the voting representative of the Albuquerque Chapter at the regional and national levels.

* * *

The deadline for submitting a paper for the 1988 Annual Reliability and Maintainability Symposium is April 14. The symposium, entitled "What's Happening? A Review of Assurance Developments for the Future," will be held Jan. 26-29 at the Biltmore Hotel in Los Angeles. Copies of a brochure containing the requirements for submitting a paper are available in the LAB NEWS office, Bldg. 814.

* * *

Zia Little League opening day ceremonies on April 11 honor the memory of Art Pino, the man who organized Zia teams in 1965 so his sons and other kids in the district could play Little League baseball. Art worked in the purchasing organization for 21 years. He died in 1972. Those who were involved in Zia's formation and benefited from it are especially encouraged to attend. Ceremonies start at 10 a.m. at Zia Little League Field (Southern & Elizabeth SE). For more information, contact current Zia president Larry Rocket on 294-1142 or Art's daughter, Carol Maestas, on 296-3280.

* * *

CONAC - Educational Opportunity Center is a non-profit organization (federally funded by the Department of Education) that offers free help to people (high school seniors through adults) in preparing to return to educational, vocational, and/or technical schooling. For more information, contact the Center on 277-5155.

* * *

Friends of Hospice and auxiliary volunteers at St. Joseph and Presbyterian hospitals are hosting a "Daffodils for Hospice Day" on Friday, March 20. Daffodils — \$5 per bunch — will be on sale from 10 a.m. to 4 p.m. at most Albuquerque hospitals and other locations around town. Volunteers will deliver flowers to people and offices who order 10 bunches or more. Proceeds will go to the Hospice program at Hospital HomeCare (HHC), which provides physical care and emotional, social, and spiritual support for patients with limited life expectancies and their families. For more information, contact HHC on 842-7100.

* * *

The 17th Annual Friends of the Albuquerque Public Library Used Book Sale is set for March 25-28 at the main library, lower level. Proceeds benefit the Library. For more information, contact Mary Matteucci on 268-8678.

* * *

Mild hypertensives are still needed for the anti-hypertensive medication study being conducted by local physician Dr. Ronald Rosandich. To participate, applicants must be otherwise healthy and must not have asthma. The study lasts 10 weeks and participants who complete it will be paid \$300. For more details, call 268-2481.

* * *

The Palo Duro Center Family Support Group is a support group that meets monthly to provide guidance and information for families and friends of long-term-care patients. Issues covered in meetings are how to resolve conflicts, cope with separation, explore alternatives, and understand Medicare and Medicaid. The free meetings are on the last Tuesday of the month from 6:30 to 8:30 p.m. at the Palo Duro

Center (5321 Palo Duro NE). The next meeting is March 31. For more information, contact the Center on 822-6222 or 822-6224.

* * *

Regina (5142) and Ralph Melbourne are trucking around town these days in the Lobo-red Mazda pickup they won in the UNM gymnastics team raffle held during half-time at a Lobo basketball game last month.

* * *

The New Mexico Museum of Natural History



EIGHT VISITORS FROM NATO recently toured PBFA II and were briefed on Sandia's SDI and other technologies. Outside the Visitor Center, where the group viewed the "Exceptional Service in the National Interest" videotape, are (from left) Mathias Schoenborn, Research Associate, Social Science Institute of the German Army, Federal Republic of Germany; Knut Roald Soerlie, Secretary of the Board, Federation of Norwegian Industries, Norway; Bernd Kubbig, Research Analyst, Hessian Peace and Conflict Research Institute, Federal Republic of Germany; Col. William Weston, Director, Public Policy, Office of the Assistant Deputy, Minister of National Defense, Canada; Mary Lou Johnson, Contract Officer, U.S. Dept. of State (and hostess for the group's U.S. tour); Rafael Bardaji, Director, Ministry of Defense, Advisory Group on High Technology and the Arms Industry, and Professor of International Relations, Complutense, University of Madrid, Spain; Luciano Bozzo, Research Scholar, International Institute of Sociology, Gorizia, Italy; Alan Fox, Deputy Director, Intelligence for Resources, Ministry of Defense, United Kingdom; and Michel Fortmann, Chair of Strategic Studies, Dept. of Political Science, University of Montreal, Canada.



PHOTOGRAPHER ODESSA WEST (3155) with four of her seven photos that were displayed in the art show at the South Broadway Cultural Center from Feb. 15-28 as part of Black History Month. (Photo by Walt Dickenman, 3155)

is starting a new session of its After-School Science Program for children in grades three to five. Activities integrating science and art will involve children in the study of fossils, dinosaurs, animals, volcanos, and minerals. The program runs for nine weeks beginning March 16. For more information, call 841-8877.

Microwave Your Shirt



Microwaving may be the next way of drying clothes, says Micro Dry Inc., a Tulsa, Okla., company that is developing a microwave dryer. The University of Tulsa is working with the concern to build a prototype.

Wall Street Journal

'Rugged' Individualist Weaves Oriental Carpets

Mechanical engineering and Oriental rug weaving — seemingly, they don't go together like the proverbial horse and carriage. But Ben Blackwell is living proof that they mesh in a very satisfactory way; rug weaving consumes much of his spare time.

Ben, an engineer in Aerothermodynamics Division 1553, became interested in knotted pile weaving (the type of weaving used to make Oriental rugs) in the early 80s when he read a couple of articles in the *Albuquerque Journal* about local weaver Gordon Scott. Ben learned that Scott, a former Albuquerque surgeon, had written a "how-to" book on Oriental rug weaving.

With Scott's book in hand, Ben used plans in it to build a loom during his 1984 Christmas vacation, and began his first attempt at rug making — a 6-in. x 12-in. "sample" rug of scrap yarn and string. "It's best to start out with a piece of junk when you're learning the technique [of knotted pile weaving]," Ben explains. "Learning what *not* to do is equally as important as learning what *to* do."

Knotty, Knotty

Ben points out that, in contrast to most types of weaving where the yarn is interlaced, knotted pile weaving means literally tying knots — thousands of them — across the width of the rug, and then packing them together as tightly as possible. A museum-quality Oriental rug will have between 200 and 500 knots per square inch, according to Ben. "The number of knots in a square inch is dependent on several things," he says. "Warp threads [the rug's vertical threads] are critical. The closer they are packed together, the more knots there are in the horizontal direction. And more tension on the warp threads results in more knots in the vertical direction. Also, using finer yarn produces more knots per square inch."

Ben entered his first "real" rug, a 24-inch-square creation based on a pattern in Scott's book, in State Fair competition in September 1985. "I was really surprised when it took First Prize in the rug category and Best of Show for weaving," says Ben. "Maybe it was the fact that it was unique; no other knotted pile rugs were entered."

That first rug had 63 knots per square inch; weaving time was about 200 hours. "For a rug of



BEN BLACKWELL (1553) works on a new rug which, when complete, will measure 30" x 50". He built the loom during his 1984 Christmas vacation.

that size and density," says Ben, "it takes about one hour to tie one row of knots [horizontally], pack them down, and trim them. Early on, I learned why fine Oriental rugs are so expensive; you're paying for the time it took to tie all those knots. For just that reason, a quality Oriental rug will generally cost more per square inch than a Navajo [rug]."

After the success of his State Fair venture, Ben went right back to work on another rug. It was the same basic pattern as the first — and about the same number of knots per square inch — but he added on at the beginning and the end of the rug because, in his words, "I find rectangular rugs more appealing than square ones."

Swastika Border

Currently, Ben's working on what he hopes will be another prize winner at the State Fair next fall. It's a larger rug (30-in. x 50-in. upon completion) and this time, the pattern is a "Ben-original." "I decided on a Chinese-style design," says Ben. "This may sound weird, but the rug has a swastika border; you'll often see that ancient symbol [a stylized cross] in Chinese Orientals, as well as in American Indian rugs." This one will take more time than the others; it has 100 knots per square inch. A fast run on the calculator says that's a lot of knot tying — 150,000 all together! Ben's been working on the current project for about a year.

Oriental rugs have been around for a long time, Ben notes. The oldest known surviving rug is the Altai Rug, found about 40 years ago in southern Siberia, in the burial mound of a fifth century B.C. prince. "The rug survived only because grave robbers didn't close the entrance to the burial chamber when they left with the jewelry," says Ben. "Later, heavy rains flooded the grave, and the rug was 'deep-frozen.'" The rug, also known as the Pazyryk Rug — after the valley in which it was discovered — is now on display at the Hermitage Museum in Leningrad.

Why Knot?

What are the rewards in what appears to be a tedious, time-consuming hobby? "It [rug weaving]

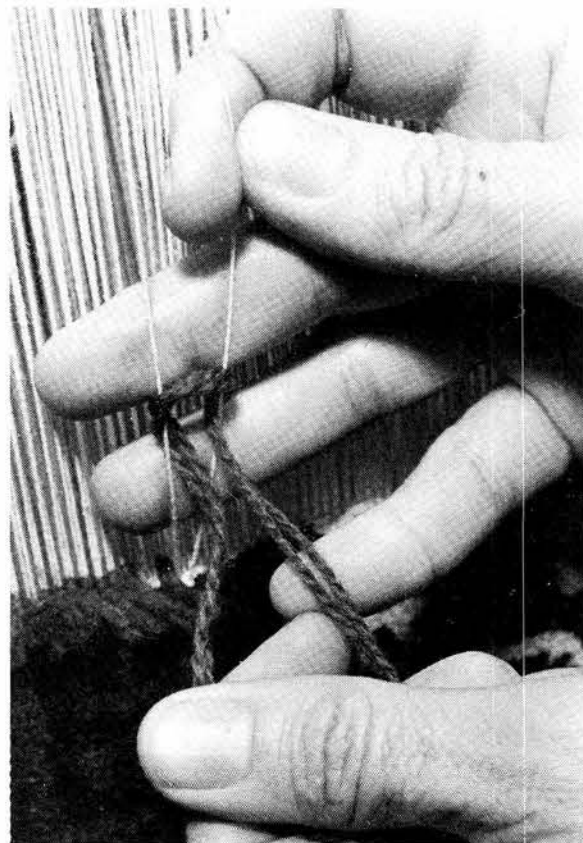
is extremely relaxing — almost soothing," says Ben. "After a while, knot tying is almost an automatic process, so a lot of concentration is not required. Its very monotony allows you to think of other things."

There's also a sense of satisfaction — and reinforcement — as he completes each row of knots, Ben points out. Since he packs the knots and trims each row as he goes, he has a finished product up to that point; there's no need to "go back over the same ground" later.

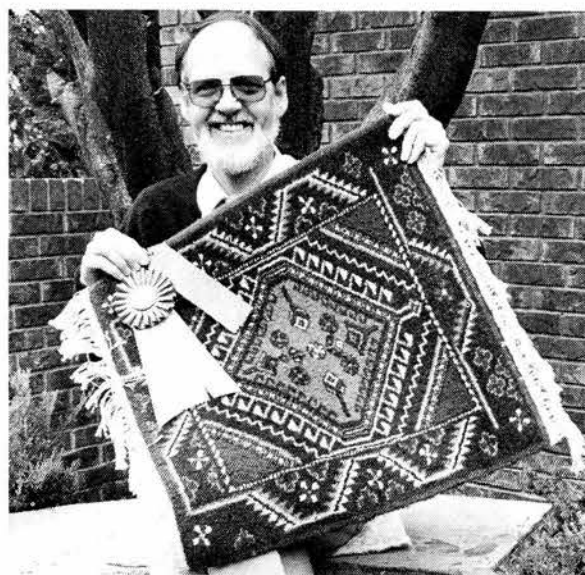
Ben says he'll be glad to talk with anyone who wants to learn more about Oriental rug weaving. "There's nothing high-tech about it," he says. "In fact, the most beautiful Orientals are produced by people in low-tech countries — Iran, China, Turkey, Afghanistan, and India, for example. And they use very crude tools in the process."

"I've noticed one thing," Ben continues. "The amount of time I spend on weaving is directly related to how much time I spend watching TV. The more TV, the more knot tying." He spends somewhere between six and ten hours per week on weaving. Since that State Fair deadline is right around the corner, Ben's hoping for some quality-type TV to help him along!

●PW



A KNOTTY PROBLEM is what's faced by weavers of Oriental carpets. Yarn is passed behind the left warp (vertical) thread, up between the left and right warps, around the right warp, then pulled down taut.



PRIZE-WINNING RUG is displayed by Ben Blackwell (1553). The 24-in.-sq. carpet took First Place and Best of Show ribbons at the 1985 State Fair.

On the Horns of a Dilemma: Book Explores Opinion Differences On Public Land Use

One of life's joys for Sandia retiree Corry McDonald is a backpacking expedition into an area where there's little or no evidence of human activity. "Wilderness is a quiet place where you can sit back, listen to nature's sounds, and get in touch with yourself," says Corry.

Corry recently wrote his second book on the subject of wilderness — its meaning, legislation that affects it, and the problems that occur when national wildernesses are legislated into being. *The Dilemma of Wilderness*, published in January by Sunstone Press of Santa Fe, takes an in-depth look at what



happens when human interests clash over the question of how public lands should be used.

"A dilemma is a situation involving a choice — sometimes between equally unsatisfactory alternatives," explains Corry. "The final solution may not satisfy people on either side of the issue. That's often what happens when wilderness legislation is enacted. Wilderness proponents may see their requests for a wilderness area scaled back in terms of total area, for example. On the other hand, that same wilderness area, though smaller than envisioned by its advocates, cramps the style of other folks: cattle growers, who no longer have motorized access to grazing areas; miners, because mineral exploitation is prohibited; and timber people, since no logging is allowed."

Follow-on to First Book

Corry's book is a follow-on to his first, *Wilderness — A New Mexico Legacy*, selected by national reviewers last year as one of the best current American books reflecting national life, history, and culture. The first book, he freely admits, was definitely pro-wilderness; the new book is an effort "to give everybody equal time," he says. Thus, it explores what sorts of arguments ensue when public land use is discussed.

To put all this in perspective, Corry notes that early man also experienced a dilemma in terms of



his initial unmodified environment (wilderness); he often faced unsatisfactory alternatives too. As Corry points out in the introduction to his book: "He [early man] could either work or starve, hunt or gather, fight or flee. He could bake in the sun or hide from it in a cave. He seemed to find himself in a predicament that made him uncomfortable most of the time." In other words, early man's alternatives were every bit as perplexing as those facing modern man.

Dave Berry, retired Sandia designer/draftsman, drew the sketches used at the beginning of each chapter (several of the drawings illustrate this article.) "I'm very grateful for Dave's help," says Corry. "His drawings capture, in a nutshell, the essence of each part of the book."

Elena Gallegos Land Grant

Certain sections of the book will be of special interest to New Mexico readers: the enactment of wilderness status for the Bisti Badlands; mining and mineral exploration in New Mexico wilderness; and

the Elena Gallegos Land Grant acquisition, "a landmark wilderness case," in Corry's words.

Wilderness areas close to big cities, such as the Elena Gallegos Land Grant area, have a set of special problems, according to Corry. More people mean more illegal incursions, and off-road vehicles (ORVs) are a very real threat to the wilderness environment. "Unfortunately, ORV dealers sell prospective customers on the advantages of being able to travel in terrain they can't navigate in conventional vehicles," says Corry. "But they [dealers] don't mention that some areas are off limits."

Corry's knowledge of wilderness legislation, along with the trials and tribulations associated with it, stems from many years of involvement with conservation groups; it all started during his high school days in Montana, when he joined the Montana Game Preservation Association. Since he moved to Albuquerque in 1947 to join Sandia, he's been active in several groups, including the Albuquerque Wildlife



Federation and the New Mexico Wilderness Study Committee. (He was chairman of the latter group for a number of years, and served as its representative on the Save Grand Canyon Committee in the 60s.)

Corry has another book — this one fiction — currently in the works. "When I started it, I had a vague feeling of uneasiness," he says. "I asked myself, 'Why am I uncomfortable writing this?' Then



it hit me: I was dealing with fiction — pure fantasy. No lists of references, no digging for facts; it wasn't what I was used to. But once I got in tune with the idea, it's gone all right."

The book in progress is a compilation of short stories, each sited in a different wilderness area. New Mexico settings include the Jemez Mountains, the Chama River basin, and the Pecos area.

Next time you want to get away from it all, head for the wilderness. (There are 21 National Wilderness Areas in New Mexico; they equal 1.98 percent of the state's area.) The quiet may startle you; you won't hear (it's hoped) the sound of motorized vehicles, nor will you be elbow-to-elbow with people.

Just keep in mind, though, that the quiet you're experiencing probably didn't just happen. Most likely it came into being after many arguments, pro and con, on the issue of wilderness enactment. •PW

(Ed. Note: *The Dilemma of Wilderness*, \$10.95, is currently available at the following book stores in Albuquerque: Book Fare, Little Professor, and Page One. Other outlets: Gallery One and The Wilderness Centre. The book is likely to show up in other stores soon, according to Corry. "And if your favorite book store doesn't carry it, you can always have them order it," he says with a grin.)



Events Calendar

- March 13-14 — "A Phoenix Too Frequent," an Experimental Theatre/masters project; 8 p.m., UNM Fine Arts Center basement, 277-4332.
- March 13-15 — "As Is," story by William Hoffman about a young man dying of AIDS; 8 p.m., Vortex Theatre (Central & Buena Vista), 247-8600.
- March 13-15 — "The Hasty Heart," drama by John Patrick about a wounded Scottish soldier who rejects offers of friendship from his hospital wardmates; 8 p.m. Fri., 6 & 9 p.m. Sat., 2 p.m. Sun.; Albuquerque Little Theatre, 242-4750.
- March 13-29 — Exhibit, "Flat Roofs and Pointed Arches: John Gaw Meem and The Architecture of Tradition"; upper gallery, UNM Art Museum, 277-4001.
- March 13-29 — Exhibit, "Drawing: Six Approaches," a look at drawings by six New Mexico contemporary artists; Jonson Gallery, 277-4967.
- March 13-29 — Exhibit: Focus on Faculty series, new work by Basia Irland, UNM associate professor of sculpture; west gallery, UNM Art Museum, 277-4001.
- March 13-July 31 — Exhibit, "Maya: The Image from the Western World"; 9 a.m.-4 p.m. Mon.-Fri., 10 a.m.-4 p.m. Sat.; main gallery, Maxwell Museum of Anthropology, 277-4404.
- March 13-24 — Exhibit, Indian Artists of Indian America (IAIA) showing of mixed media art by student artists; 9 a.m.-5:30 p.m., Indian Pueblo Cultural Center, 843-7270.
- March 13-15 — "Who's Afraid of Virginia Woolf?"; New Mexico Repertory Theatre performance of Edward Albee play; 8 p.m., 2 p.m. matinees Sat. & Sun.; KiMo Theatre, 243-4500.
- March 14 — Beethoven Special Event Concert, New Mexico Symphony Orchestra tribute to Arthur and Elisabeth Spiegel; 8:15 p.m., Popejoy Hall, 842-8565.
- March 14, 21, & 28 — "Natural Selections," film series, includes "Sandia Mountains - Plants and Animals," "Greater Sandhill Crane Story," and "Desert"; 1-3 p.m., New Mexico Museum of Natural History, 841-8837.
- March 15 — Gem and Mineral Show, competitive displays and demonstrations of gold-panning and mining techniques by geologists, mineralogists, and rock hounds; Old Albuquerque Terminal Building, Albuquerque International Airport, 884-9457.
- March 19 — Margaret Jenkins Dance Company, lecture/demonstration on contemporary dance; free, South Broadway Cultural Center, 848-1320.
- March 15, 21, & 22 — Albuquerque Rose Society Annual Rose Pruning Demonstration, 10 a.m.-3 p.m., Prospect Park Rose Gardens (Wyoming Regional Branch Library, 8250 Apache NE), free, 344-0467.
- March 20-21 — Margaret Jenkins Dance Company, contemporary dance performance; 8 p.m., KiMo Theatre, 848-1374.
- March 21 — Perennial Plant Sale sponsored by the Council of Albuquerque Garden Clubs; 9 a.m.-4 p.m., Albuquerque Garden Center (10210 Lomas NE), 296-6020.
- March 21 — Children's Concert, New Mexico Symphony Orchestra Director Neal Stulberg performing as Mozart in "Mozart Live!"; 2 p.m., KiMo Theatre, 848-1374.
- March 21 — "Hopping Down the Bunny Trail," bunny tales for children ages 3 and older presented by Trespassers William Bookstore and UNM Continuing Education Dept.; 1 p.m., UNM Continuing Education Conference Center, 277-3751 or 268-4601.
- March 26-29 — "Fiddler on the Roof," Albuquerque Civic Light Opera presentation; 8:15 p.m., 2:15 p.m. Sun.; Popejoy Hall, 345-6377.

The Rich and the Super Rich



How to Be a Mogul, a new book "for those who know the best things in life are things," says rich people have country houses while moguls have countries. Rich people deduct all expenses; moguls have Liberian citizenship.

Wall Street Journal

MILEPOSTS

LAB NEWS

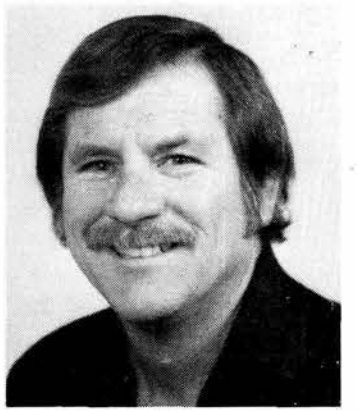
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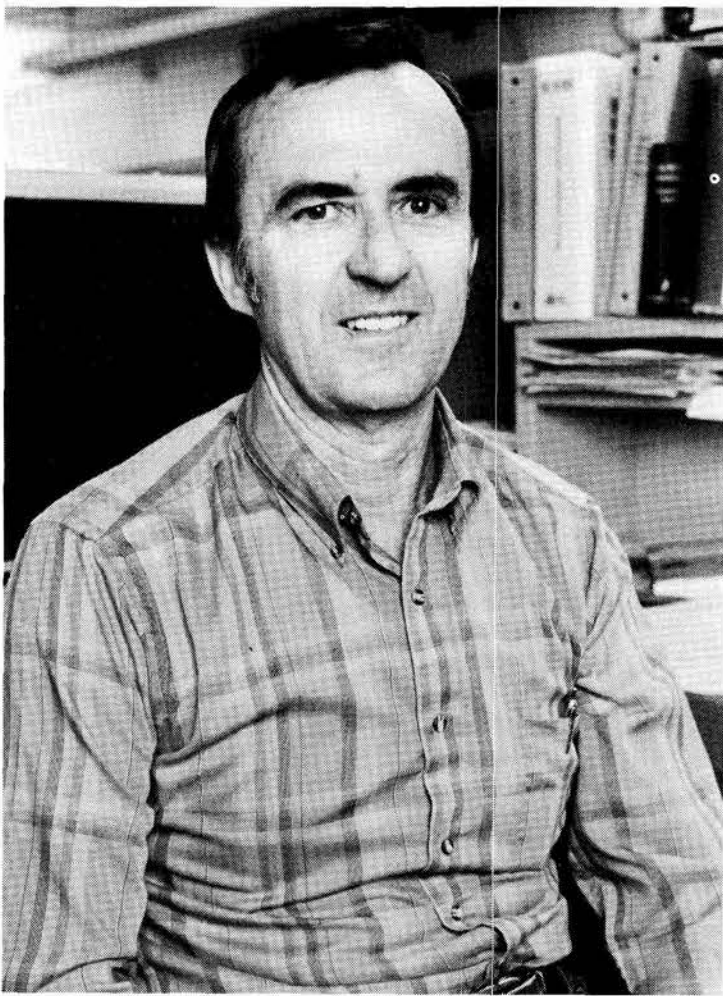
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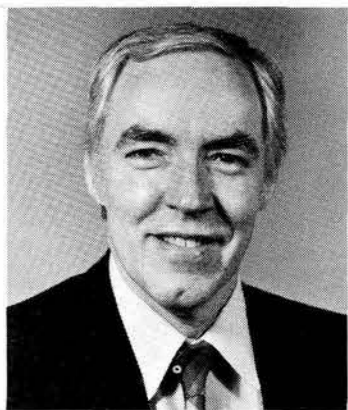
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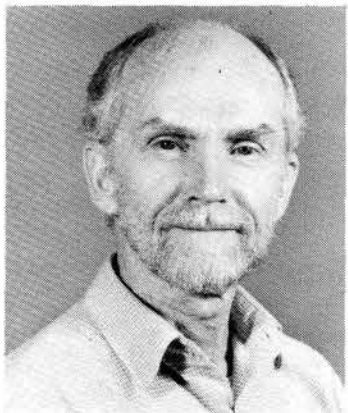
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Ruth Varga (3150) 10



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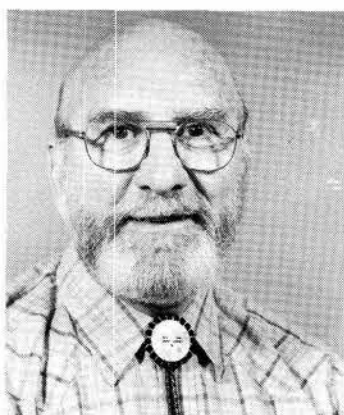
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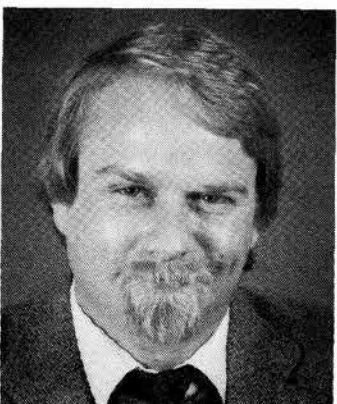
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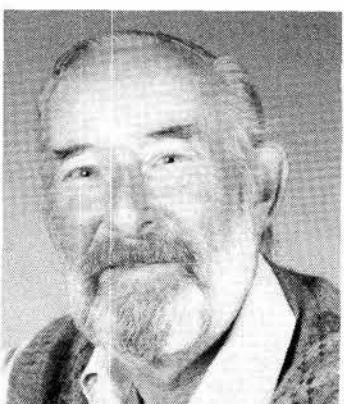
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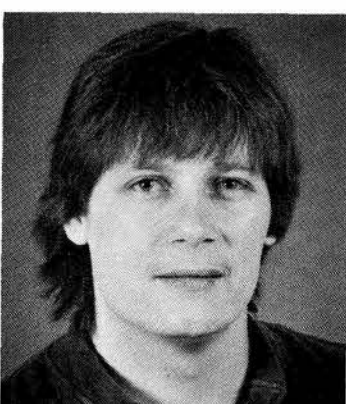
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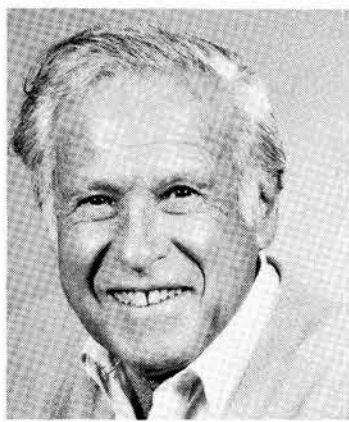
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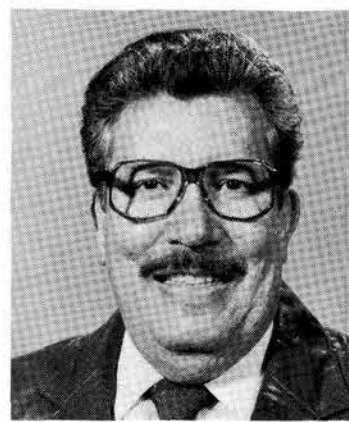
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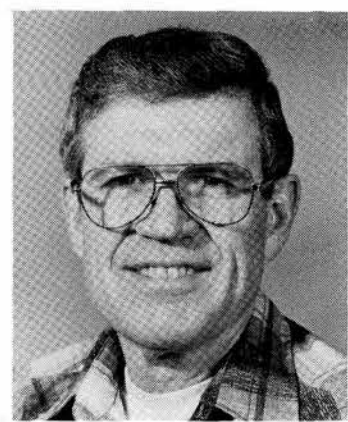
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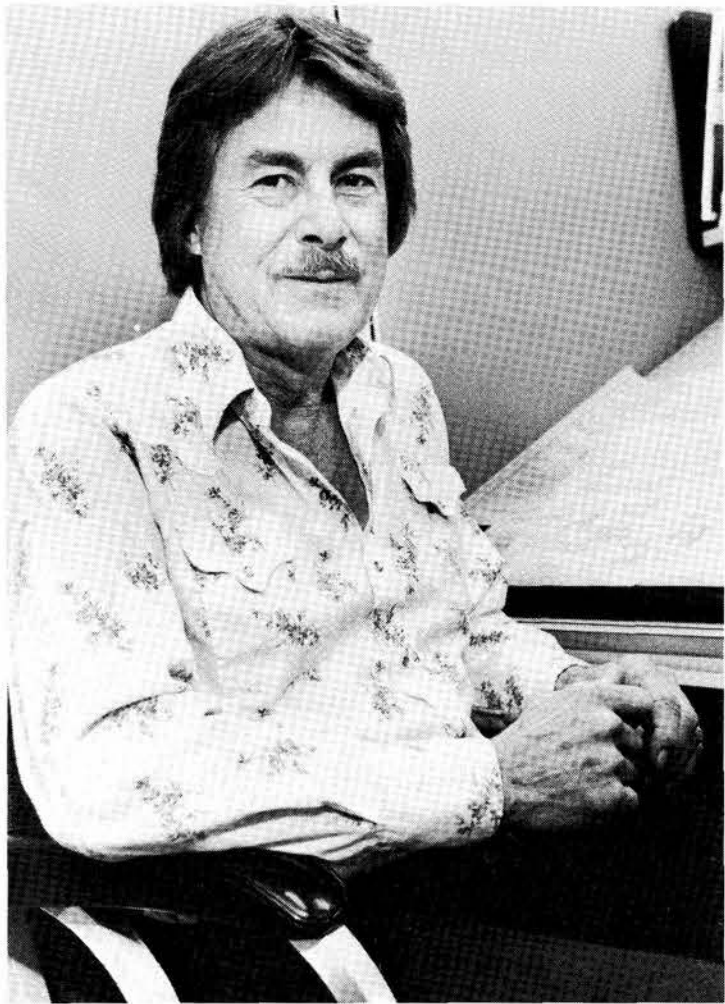
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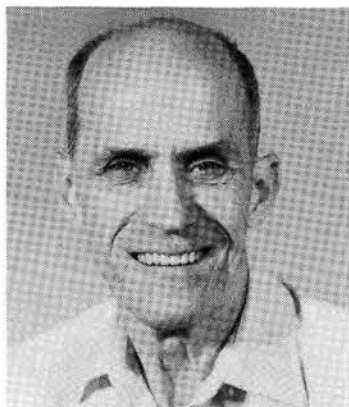
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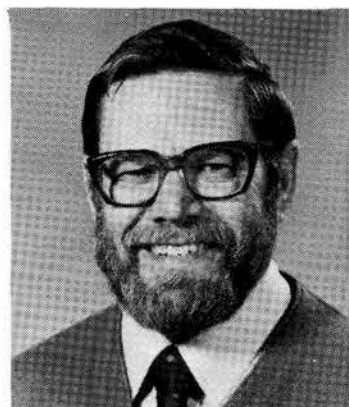
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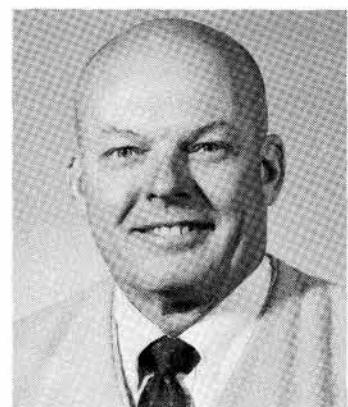
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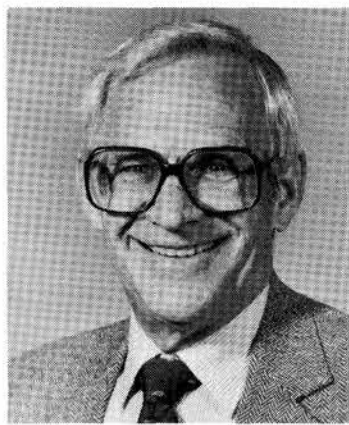
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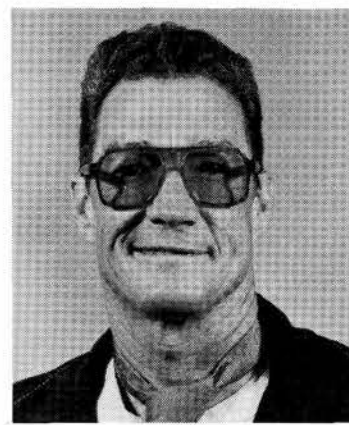
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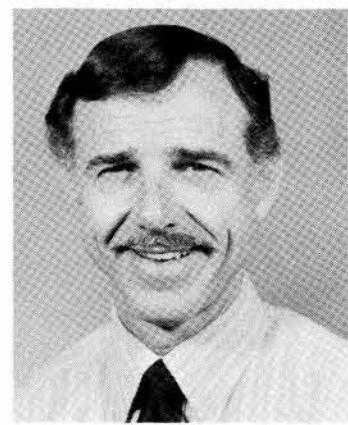
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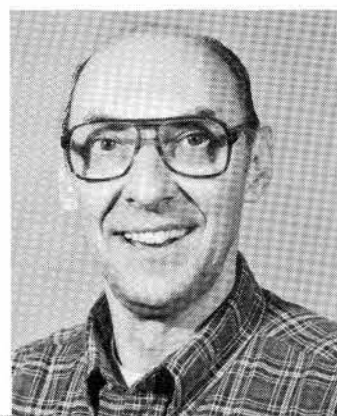
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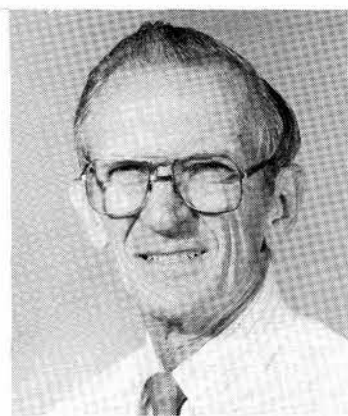
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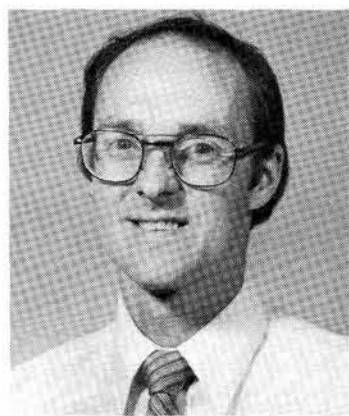
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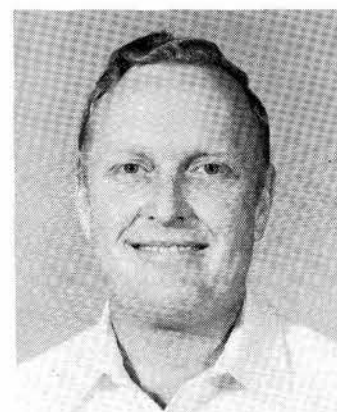
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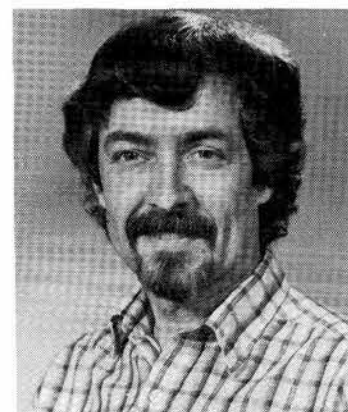
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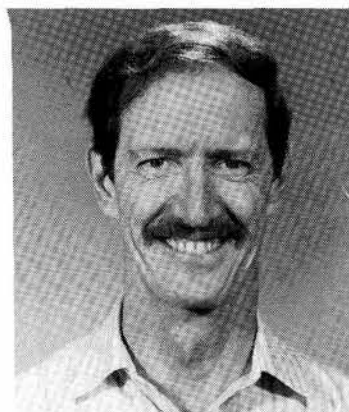
Tom Mayer (2634) 15



Paul Pierce (2335) 20



Gary Peterson (1266) 20



Frank Ezell (7121) 20



Art Jimenez (3424) 35

Fun & Games

Bowling — SANDOE Bowling Association January Bowlers-of-the-Month are: Men's Scratch, Milt Stomp (6222), 657; Women's Scratch, Margret Tibbetts, 599; Men's Handicap, Ray Letourneau (Ret.), 707; Women's Handicap, Cecilia Gutierrez (DOE), 664.

A 4-Game No Tap Tournament is set for Saturday and Sunday beginning at 1 p.m. at Fiesta Lanes. This is a male/female couple event. To enter, contact Fidel Perez (7485) on 268-3242 or Ruby Cochrell (6400) on 4-5779.

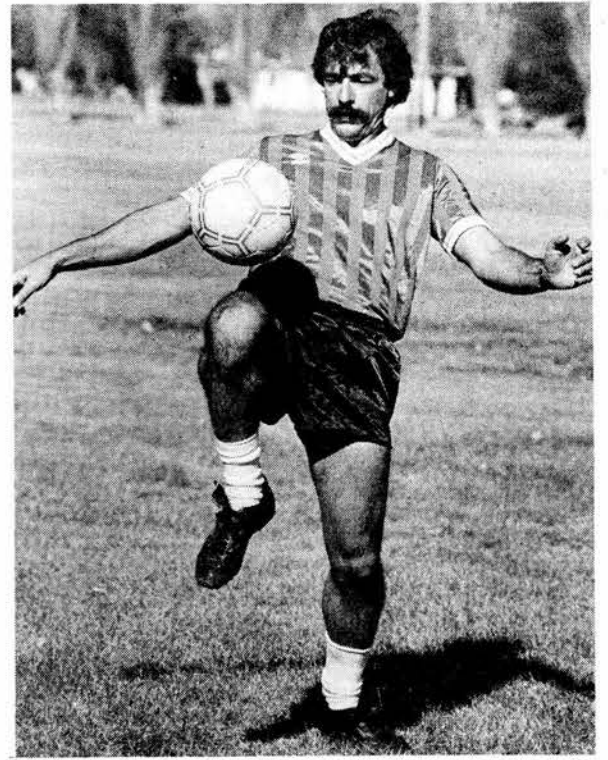
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Archery — If you're all a-quiver because you have no place to practice your archery skills, note that the Manzano Archery Club has a practice range as well as a field range. These ranges have numerous marked distances. For membership information, contact Dewey Reed on 265-2687 or Kerry Lamppa on 299-1119. Membership is required to use the ranges.

* * *

Self-Protection Seminar — A women's self-protection seminar sponsored by SERP is scheduled for Wednesday evenings beginning April 1 through May 20 at the Coronado Club from 7-8:30 p.m. The seminar, for women ages 16 years and older, is designed to provide the basics of self-protection. The course includes lectures, demonstrations, practice, role-playing, and case histories. Certificates will be awarded upon completion. Call Stan Ford on 4-8486 for details.

LOOK MA! NO HANDS! Larry Azevedo (1152) shows how to handle a soccer ball. He was named National Youth Soccer Coach of the Year by both the National Soccer Coaches Association of America and the U.S. Youth Soccer Association at the NSCAA National Convention in Boston on Jan. 23-25. The award is for his dedicated efforts to promote and develop youth soccer (the first New Mexican to receive it). Larry didn't play or coach soccer until his 14-year-old daughter began playing. He coaches her team, the Duke City Soccer League Rio Grande '73 Girls.



UNCLASSIFIED ADVERTISEMENTS • UNCLASSIFIED ADVERTISEMENTS • UNCLASSIFIED ADVERTISEMENTS • UNCLASSIFIED ADVERTISEMENTS

Deadline: Friday noon before week of publication unless changed by holiday. Mail to Div. 3162.

Ad Rules

1. Limit 20 words, including last name and home phone.
2. Include organization and full name with each ad submission.
3. Submit each ad in writing. No phone-ins.
4. Use 8 1/2 by 11-inch paper.
5. Use separate sheet for each ad category.
6. Type or print ads legibly; use only accepted abbreviations.
7. One ad per category per issue.
8. No more than two insertions of same ad.
9. No "For Rent" ads except for employees on temporary assignment.
10. No commercial ads.
11. For active and retired Sandians and DOE employees.
12. Housing listed for sale is available for occupancy without regard to race, creed, color, or national origin.

MISCELLANEOUS

VW OMNIBUS REAR SEAT, spare wheel, and wheel cover. Herrmann, 255-7327.

BORDER COLLIE PUPS, ready for new homes in April. Orear, 256-1941.

"GI JOE" FIGURES and other items; wheelchair, \$95 OBO. Duffy, 298-7301.

CAMPER SHELL, fits small shortbed pickup, needs repair, \$50 OBO. Stavig, 291-9043.

CAMERA, 35mm Pentax K1000, w/50mm, 24mm wide-angle and 80-200mm zoom lenses, flash, filters, cases, and straps, \$195. Barr, 821-5870.

ROWING MACHINE, Amerec 610, precision, seldom used, adjustable resistance, industrial quality, \$125 OBO. Sellers, 292-0466 after 6.

McDERMOTT CUE STICK, \$220 new, sell for \$150. Zownir, 256-3753 or 256-3717.

CARTOP LUGGAGE RACK, holds several suitcases, \$20. Harrison, 292-6856 evenings.

QUEEN-SIZE WATERBED, pine bookcase headboard, complete w/heater, \$100; women's golfbag, light blue, \$20; golf cart, \$5. Scott, 884-3454.

DESK, 30" x 48", simulated wood and leather; Hammond Sounder III chord organ. Negin, 266-1983.

CARPET, 2 rolls, \$50; kitchen cabinets; 4' x 15' round swimming pool sides, no liner, \$50. Brumley, 877-2667.

TRUCK TIRE, 8.75 x 16.5, \$25. Hole, 255-1444.

TWO CAST IRON SINKS, white, 19" round, w/fixtures, rim-type, \$20/ea. Volk, 299-1702.

DARK WOOD WATERBED, w/large headboard, mirror, and shelves,

used 1 year, cost \$1000, sell for \$250 OBO. Mason, 281-3052.

HERTER SHOTSHELL RELOADER and Herter powder and shot measure, instructions for both. Tolmie, 881-6640.

TLR CAMERA, Mamiya C-3, 6x6 format, w/80mm lens, WL finder, and Eyelever PD meter finder, case, \$180. Neal, 292-8675.

AUTO MACRO LENS, Olympus 50mm F3.5, never used, \$190 OBO. Jojola, 292-7962.

COCKATIEL, female, w/cage, \$50; Bell & Howell movie projector, screen, and camera, \$125; Stenorette, reel-to-reel, \$50 OBO. Carlin, 292-5428.

ELECTRIC TYPEWRITER, Brother cassette, "Correct-O-Riter I", \$79. Reda, 821-3817.

TWO STUDDEN SNOW TIRES, E78-14. Silverman, 298-1308.

SOFA AND CHAIR, orange and white, \$75/pair; double-bed frame, mattress, and box spring, \$50. McAllister, 296-7774.

THREE-POSITION RECLINER, \$50; pole lamp, \$20; hall rug, 2' x 9', \$15; Oster hand massager, \$5; pair of vanity lamps, \$20. Easton, 256-7717.

DOUBLE-HUNG STEEL SASH and frame glazed windows; two are 24" wide, 53" high; one is 24" wide, 61" high, \$10/ea. Stamm, 255-2640.

UNITED FREEZER, \$200; child's desk and chair, \$30. Lackey, 869-9333.

WOMEN'S DOWN COAT, new, size 8, \$50; king-size bed set w/frame, oak headboard, mirror, linens, \$150. Sharp, 293-1824.

"BOOK OF LIFE" by Zondervan, illustrated 24-volume Bible-reading plan. Walker, 281-9587.

FREE LANDSCAPING ROCK, 2", approximately 3 yards, you scoop and haul. Widdows, 298-7153.

WATERBED MATTRESSES (full-motion and waveless) liners, heaters; conditioner (50c/4-oz. bottle); metal frame for twin/full waterbed; air mattress cover. Ottinger, 296-3526.

FLYING CLUB MEMBERSHIP, 1976 Archer II, full IFR, \$1550 firm. Trujillo, 293-2132.

FREE USE OF VEGETABLE GARDEN PLOT in Carnuel, water included. Boslough, 294-3907.

FORD RIM, steel for woodcutting bracket, countertop/sink, light fixture, old console TV, plastic runner, free screen door. Long, 294-4591.

LEATHER COUCH, Brazil Contempo, \$300; Honda Civic rims w/tires, \$10/ea., and AC compressor w/brackets, \$20; 33-12.50 x 15" all-terrain tires w/rims, \$75/ea. Reif, 299-2665.

TWO TV CARTS, \$15 and \$12, both on casters. Harper, 298-0146.

VETTA II BICYCLE windtrainer w/workstand; hand-made pine computer desk. Shwiller, 881-6921.

COMPUTER: FORTUNE 32:16 with UNIX OS, 10MB, 1MB, RAM, word processor, spreadsheet, VT100 emulation, FORTRAN, C, BASIC,

\$1850. Montry, 821-3758.

BLACK LABRADOR PUPPY, female, purebred, no papers, all shots, spayed, 7 months old, \$100. Jones, 281-3617 after 6.

KENMORE ELECTRIC DRYER, copper colored, \$75. Robertson, 293-1007.

SEARS AUTOMATIC WASHER, needs work, \$30; Sears airless paint sprayer, \$25. Melvin, 298-6402.

BALLOON CLUB SHARE, one-fifth ownership of Cameron VIVA-77 complete with fan, trailer, and extras, \$2500 plus. Bair, 296-3505.

ELECTRIC FRIGIDAIRE STOVE, self-cleaning built-in double oven and burners; 42" Nutone range hood; cast iron kitchen sink. Cilke, 296-3665.

GARAGE DOOR OPENER, Chamberlain 444HD, 1/3-hp, 6 yrs. old, w/2 remotes, \$120; furnace thermostat w/setback, \$15. Kwak, 294-2524.

CHAIN SAW, gasoline, 14", Craftsman; chest-high waders, size 10; hanging ceiling light, antique brass, 2 globes. Randall, 299-3935.

HP41C SCIENTIFIC CALCULATOR w/quadrant memory module, equals HP-41CV, \$100; 25" color TV, \$50; kitchen cabinets. Carson, 281-5115.

TRANSPORTATION

'75 KAWASAKI 900cc Z1-B, 28K miles, adult-ridden, Vetter fairing, luggage rack, backrest, maintenance records available, \$995. Irwin, 822-1831.

'54 FORD CUSTOMLINER, new exterior paint, tires, headliner, and upholstery, \$1800 firm; MGA parts. Schaub, 821-7242 after 5.

'83 SUZUKI GS 850G, shaft drive, windshield, rear luggage rack, 7K miles, \$1995. Mills, 823-4484.

'86 CHEV. S-10 4x4, fully loaded, all power, AM/FM cassette, 13K miles. Avila, 344-7845 after 5.

'83 SUBARU SW, AC, AT, 4-dr., power windows, \$5200. Lackey, 869-9333.

'69 FORD GALAXIE convertible. Wagner, 822-1031.

'84 VW SCIROCCO, 5-sp., AC, cruise, AM/FM cassette, transferable warranty, \$6500. Bryant, 831-7224.

'81 SUZUKI GS450TX, adult-ridden, garaged, extras, \$795. Hueter, 299-7263.

'84 FORD ESCORT SW, beige w/red interior, diesel, 42 mpg, 51K miles, AC, AM/FM tape, 5-sp., one owner, \$3200. Davis, 266-0656.

'75 MERCEDES 280, loaded, \$3500 down, balance in 30 days, \$6000. Collado, 299-5998 days, or 842-0218.

'69 ELDORADO, some body damage, \$600. Zownir, 256-3753 or 256-3717.

GIRL'S BICYCLE, 20", \$50; Big Wheels, \$10. Abel, 296-6089.

16-1/2' FAMILY RUNABOUT and ski boat, full canvas, 115 Merc w/power tilt and trim, \$2700. Fisher, 881-8072.

'84 CORVETTE, silver, AT, 77K miles, \$13,500 OBO. Helgesen, 828-2114.

'79 ALFA ROMEO SPIDER, 47K miles, black Deltron paint, new carpet and upholstery, \$5400. Gomez, 298-9132.

'82 CHEV. CAVALIER, 2-dr., AC, PS, PB, AT, tilt, cruise. Williams, 1-864-3617.

TREK 560 BICYCLES, new, Reynolds 510 tubing, \$325; five 10x15 6-hole rims w/Armstrong "Rhinos," \$275. Loucks, 281-9608.

'80 CADILLAC ELDORADO, 56K miles, loaded. Rowley, 281-2725.

CAPRI 14.2 SAILBOAT w/trailer, extras. Shwiller, 881-6921.

'80 YAMAHA 650 SPECIAL, garaged, 7K miles, \$699 OBO. Romero, 821-7154 after 5.

YAMAHA 400 Enduro, \$600. Ramirez, 892-5328.

'80 AUDI 4000S, 4-dr., 5-cyl., AT, AC, AM/FM radio, sunroof, 73K miles, \$2700. Hoffman, 296-3799.

'78 BMW 320i, AT, AC, AM/FM cassette, \$5000 OBO. Renken, 243-1724.

'75 AUDI 100LS, AT, AC, 4-dr., \$700. Ezell, 821-1768.

WOMAN'S BIKE, 10-sp., Raleigh, \$80. Chirigos, 298-3837.

'81 HONDA CM400, one owner, 9K miles, luggage rack, new tires, just tuned, windshield, \$595 OBO. Robertson, 293-1007.

'78 VW SCIROCCO, AM/FM cassette, AC, new paint. Stixrud, 298-0478.

'63 AUSTIN HEALY, fully restored, no rust or accidents. Herrmann, 255-7327.

FISHING BOAT, 14', aluminum, w/15-hp Johnson outboard motor; Honda Trail 90, Trail 70, motorcycle. Whitfield, 884-5104.

REAL ESTATE

3-BDR. MOBILE HOME, 1-3/4 baths, 14' x 65', Cedar Crest, extras, \$9500 OBO. Brocato, 281-9656.

9.8 ACRE LOT in Edgewood area, water at lot edge, close to electricity and phone, includes south-facing ridge, \$45,000. McAllister, 296-7774.

MOBILE HOME, 12' x 60', in Terrace Park near Base, available April 1, \$7,500. Schuch, 345-1206.

3-4 BDR. REMODELED HOME, pitched roof, brick front, quarry tile floors, auto sprinklers, LaCueva district, near Sandia bus. Carrigan, 821-5856.

5 ACRES, South 14, near Apple Valley Ranch, power, water, small trees, \$30,000. Sharp, 293-1824.

3-BDR. HOME, NE, on 1/3 acre, 2250 sq. ft., solarium, double garage, LR, den w/FP, 1-3/4 baths. Garcia, 821-9580.

14' X 70' MOBILE HOME, on half-acre in Peralta, garage/workshop w/utilities, deep well and 2 other wells, extras, \$46,000. Vigil, 869-6870.

3-BDR. MOBILE HOME in Las Cruces, 1 mile from NMSU campus, 1-1/2

baths. Kracko, 299-1030.

2-BDR. HOUSE, downtown, 1-3/4 baths, oak/pine floors, circa 1906, assumable FHA loan. Baumgardner, 243-0789.

1 ACRE LOT in Angel Fire, all utilities, in country club area, \$14,900. Montry, 821-3758.

3-BDR. HOME, 2350 sq. ft., spa, large lot, backyard access, Osuna/Madison, Sandia school district. Melvin, 298-6402.

3-BDR. HOME, 1-3/4 baths, den, near Candelaria and Morris, \$66,000, \$15,000 down or refinance. Long, 296-2590.

2-BDR. MOSSMAN TOWNHOUSE, 2 baths, 2 yrs. old, Bear Canyon, landscaped. Stephens, 821-7960.

3-BDR. HOME, NE, 1-3/4 baths, 2-car garage, ceramic floor tile in entry, kitchen, and utility, wood stain trim throughout, 9 yrs. old, \$92,500. Sepulveda, 299-2805.

WANTED

HOUSEMATE, Singing Arrow area, 5 min. from Labs, 3-bdr., 2 baths, den w/FP, garage, pets and smoking OK, free utilities, \$275/mo. Nordeen, 296-7898.

REGULATION BASKETBALL POLE and backboard in good condition. Garcia, 888-4735.

OUTBOARD MOTOR, 9.9-HP or 15-HP OMC brands, in good working condition. Holmes, 292-0898.

DEPENDABLE OLDER VEHICLE under \$1000 for college student, prefer compact, manual transmission. Hueter, 299-7263.

STOCK 6-HOLE WHEELS to fit '81 Blazer. Johnson, 298-4553.

SABINO CRYSTAL FISH, mouse, snail, and turtle figurines stolen in burglary. reward. O'Bryant, 268-9049.

HOUSEMATE, non-smoking female, 3 bdr., 2 baths, NE Heights, \$190 plus 1/3 utilities. Schafer, 268-3082.

WORK TRUCK, 4WD, 3/4T, extended cab; rims, 16" x 6-hole pattern, normal width. Loucks, 281-9608.

HELP WITH HOUSECLEANING, half day on Saturday, \$25; reliable car for under \$1000. Dubicka, 296-6557.

USED REFRIGERATORS in good condition and not too small. Long, 296-2590.

RELIABLE STUDENT (preferably with lawn mower) to do yard work near Academy and Ventura every weekend, rate negotiable. Patterson, 822-1196.

RELIABLE VEHICLE for teenager, prefer simple domestic, manual, 4-cyl., gas (example: '83 Ford Escort or '82 S10 PU). Myers, 294-7316.

LOST AND FOUND

KEY FOUND in water tower parking lot, for pre-1964 Ford car or truck, w/house key. Irwin, 822-1831.

Banks + Brew = Bash, Irish-Style

McNAMARA'S BAND MAY NOT be there, but that renowned son of Erin, Bob O'Banks, *will* be. Bob's piano playing is featured at the annual St. Patrick's Day blast from 4 to 8 p.m. in the main lounge next Tuesday, March 17 — the day those mischievous leprechauns are out in full force. Also featured are lots of free munchies, the traditional green beer (!), and special prices on other drinks. Don't worry if your name's not McGillicuddy, O'Riley, or Flanagan; *everybody's* Irish that day. And it's a sure bet you can prevail on Bob to play your favorite Gaelic ditty while he's center-stage from 5 to 7. Erin go bragh!

THE FREDDIE CHAVEZ FOUNDATION gives you Latin music lovers all the support you need — tonight from 8 p.m. to midnight. Beforehand, fill up on some fabulous food from a most reasonable (\$7.95) buffet: Baron of beef, fish, and a full salad bar are among the goodies offered. Reservations requested, please (265-6791).

THOSE SHARP SHARKS are at it again . . . yep, the T-Bird card players have another session scheduled this month on Thursday, March 19, starting at 10:30 a.m. These folks' table skills are known far and wide, not to mention their table manners — there's no double dealing when *this* bunch gets together! Shuffle on in and learn what it means to call a spade a spade and a club a C-Club.

IT'S ALL GREEK to us when the Club hosts another Greek Night on Saturday, March 21. Start things out with a buffet (6-9 p.m., \$7.95) featuring zesty Zorba delights: Greek and/or tossed salad, chicken riganato, roast lamb with potatoes, rice pilaf, spinach pie, and Greek-style green beans. All kinds of libations available at the bar, too, including exotic Greek wines and liqueurs to get you in the right spirit(s). Experience a special treat from 7:30-8:30, when the well-known Palamania Dancers, in costume, perform a number of native (Greek, of course) dances. At 8:30, hit the dance floor yourself when Together shows up to get you that way. This is always a popular event, so it might be a good idea to call in an early reservation.

NO INFLATION HERE: We're talking about the price of pool and patio passes, now on sale at the recreation office. You'll be pleasantly surprised to learn that fees for the finest facility in town are unchanged from last year. Summer passes for individuals are \$15; for a couple, \$30. A family of three pays just \$45; add \$5 for each additional family member. Those lazy, crazy days of summer are just around the corner — and not a moment too soon for most of us. Be prepared!

SPEAKING OF POOLS and patios, now is the time to find out all about the Coronado Aquatic Club, open to Club members' children, age 18 and under. An info meeting on CAC activities is scheduled March 26 at 7:30 p.m. Interested swimmers and their parents who attend get the lowdown on the practice schedule, swim meets this summer (the season starts June 6), and what it costs to be a CAC member. CAC Board members will be around to answer questions and register swimmers. Membership doesn't mean just hard work and swim-meet competition; the emphasis is on fun and a whole lot of partying, we're told by Board president Linda Peterson. Only requirement for CAC membership (besides the age limitation) is being able to swim the length of the C-Club pool unaided. More info from Linda on 883-8463 or Nancy VanDevender on 821-9435.

THE BEAT GOES ON — the sagebrush shuffle beat, that is. The Poor Boys received rave reviews after their last sparkling appearance in beautiful downtown Isleta, and they're back at the C-Club next Friday night (March 20) by popular demand. Before that crazy country/western music starts at 8 p.m., eat hearty at the two-for-one special dinner chuck

wagon. Fare that night is filet mignon or scallops — an elegant menu for cowboys (and girls), if there ever was one. The price is pleasing, too: \$14.95 for two dinners, your choice of entrees.

SPRING FEVER is caused by the bite of the travel bug. To get some ideas about places to go and things to see on your vacation, plan to attend a Travel Fair on Tuesday, March 24, from 5 to 7 p.m. You'll go home with a fistful of information on sojourns to faraway places — some (not all) with strange-sounding names. Visit booths that supply info on all upcoming trips (some of which are still in the planning stages) sponsored by the C-Club Travel Committee, and sign up for some of the already-arranged jaunts. Free munchies, along with low-cost food and beverages, are available as you plan ahead for that hard-earned vacation time.

ALWAYS ON SUNDAY is the Club motto, as it puts together another one of those scrumptious brunches for the whole family. The next day-of-leisure delight is set for March 22 from 10 a.m. to 2 p.m. Chef Henry says he's going to come up with some menu surprises for this one; rest assured it'll be a bountiful spread, just like always. This best-deal-in-town brunch goes for the unbelievable price of \$5.95 for adults; kids under 12 eat at half price. Don't tell *us* there aren't any bargains out there! To get in on this one, make your reservation right now.

More on VCPs

Still wondering about what to do with that VCP distribution? A couple of Albuquerque brokerage houses plan seminars the week of March 23 to discuss tax effects of the distribution, IRA rollovers, investment options, and impact of the 1986 Tax Reform Act:

March 23 - Merrill Lynch (Cynthia Reilly), 4:45 p.m., Eldorado room, refreshments served.

March 26 - Dean Witter Reynolds (Michael DeVincentis, Bill Donald, Bill Wiley, and Steven Stubbs), 5-6:30 p.m., Eldorado room.

PRIME RIB OR HALIBUT — and Brown Sugar for dessert. That's what you can look for at the two-for-one special two weeks from tonight, March 27. Brown Sugar, for the uninitiated, is a group that knows what Latin music is all about. And they'll prove it as you head for the dance floor from 8 p.m. to midnight that night. Don't put off reserving your dinner and cha-cha space; give the Club a call on 265-6791.

PACK AND TRACK is the winning combination for those intrepid Lobo followers, the Coronado Wolfpack, on March 28 at the Albuquerque Downs

Jockey Club, beginning at 11:30 a.m. The Lobos aren't running that day, but the horses are. For \$15/person, you get Jockey Club reserved seating; valet parking at south end of grandstand; program, tip sheet, and betting guide; and an elegant buffet. Bring your relatives and friends, but no kids under 12, please. Mail a check (made out to "Wolfpack") to Dick Baughman (1154), or to Dick's home address — 7309 Dellwood NE, Albuquerque 87110.

Entry deadline is March 20 for the Wolfpack/UNM Golf Tourney, set for April 4 at Tijeras Arroyo Golf Course. Each four-person team includes one UNM player and three Wolfpackers. Entry fee of \$15 includes golf, a steak cookout, other refreshments, and prizes; non-golfing spouses get the steak dinner for just \$6. Again, checks go to Dick Baughman. More info from Joe Llamas on 4-8831 or 881-3538.

LAUGHING ON THE OUTSIDE (*and* inside!) is what you'll be doing when you sign up for one of those super trips put together by the C-Club Travel Committee. We kid you not — there are some fantastic opportunities among them at very reasonable prices. What a way to go!

West — Head that-a-way to Sedona, Ariz., and other points of interest May 9-12. Visit natural wonders along the way, such as the Petrified Forest and Painted Desert, and see beautiful Oak Creek Canyon between Flagstaff and Sedona. Other side trips include Montezuma Castle, Holy Cross Chapel, and Jerome State Historical Park. The tab of \$170/person (double) includes charter bus fare, two nights' lodging, and snacks and drinks along the way.

North — Spectacular scenery, humongous glaciers, a week-long cruise along Alaska's coast: All these and more are yours when you reserve your space for this blockbuster trip. You have a couple of options — the land/cruise package (Sept. 8-20) or cruise only (Sept. 13-20). The former covers city tours of Anchorage and Fairbanks, a visit to Mt. McKinley National Park (along with a ride on the McKinley Explorer train), and a stern-wheeler cruise as part of your stay in Fairbanks. Cruise ports of call include Ketchikan, Juneau, Skagway, and Vancouver. Cost of the complete land/cruise package is \$2325/person (double); for cruise-only types, it's \$1642. Included are all transportation costs (land/sea/air), lodging along the way, all meals while you're aboard the luxurious *Regent Sea*, and taxes/tips. Price breaks available on triple and quad occupancy, and final payment isn't due until July 20.

Sympathy

To Bob Scharrer (5145) on the death of his mother-in-law in Albuquerque, Feb. 13.

To Tex Ritterbush (133) on the death of his mother in Nebraska, Feb. 16.

To Viola Pino (3426) on the death of her father in Lemitar, Feb. 19.



PAULA WEBB (3140) passed all six parts of the Certified Professional Secretary (CPS) exam last November and recently obtained her CPS rating. An employee of Sandia for six years, Paula has been the department secretary in the Tech Library since 1983. A support group for secretaries studying for the CPS exam meets regularly at the Coronado Club. For more information, call Sue Henderson (3700) at 4-8002 or Estelle McKenzie (5210) at 4-9645.